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Gravel Plant of Unusual Design

Hillside Washed Sand and Gravel Co. Completes New Plant Near Milwaukee, Wis., Without Bins

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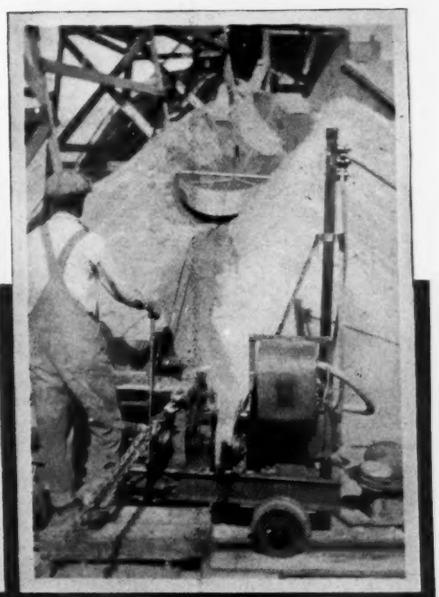
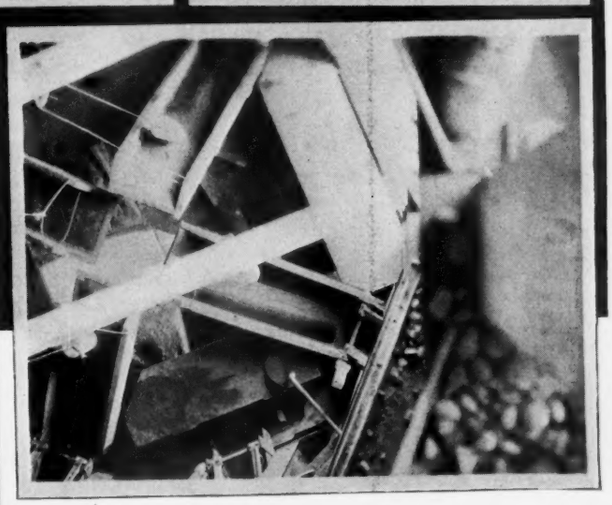




Two views of the drag scraper outfit, the batching hopper, and a view looking down on chutes at top of tower

ONE OF THE NEWEST and at the same time one of the most novel sand and gravel plants in the Middle West was placed in operation last season by the Hillside Washed Sand and Gravel Co., of Milwaukee, Wis., at its pit near Muskego, Wis. The particular feature of this plant is the absence of the usual type of bins, with instead a special stockpiling arrangement in a circle about the washer. The merit claimed for this design is that it permits a large storage capacity without the necessity of purchasing a reclaiming shovel to work entirely on the stockpiles. It also requires less space than the usual plant and stockpiles combined.

Another advantage of this system is that the plant production can be continued independently of shipping. In other words, the plant can be producing to full capacity for some time without the necessity of any shipment, the shipping capacity having little relation to the production capacity. This, of course, works both ways, so that when necessity arises, shipping can be made in much larger quantities than the capacity of production.

The plant is a drag-scraper operation working a pit which had been operated for about three years previous to its being taken over by the Hillside company, which is a new concern. There is at present an old plant adjacent to the new layout, and this had previously been operated at still another location until it was moved to this site three years ago. This plant was abandoned when the new one was placed in operation.

Main plant, showing unusual bin arrangement

The pit has a good grade of gravel in a hill above the plant, and now has a face some 50 ft. in height. It is clear of foreign matter and clay, but does contain a large number of boulders more than a foot in size and some reaching as high as 2 ft. across. Naturally this adds considerably to the difficulty of operation. The sand runs approximately 25% of the total material in the bank.

Stripping is necessary, as there is a foot or two of overburden over the deposit. An old shovel was at first used for this work but it was found more economical to contract the work to the Wisconsin Drainage Co., which did the work by dragline scraper. The bank is of fairly compacted material and the usual practice is to blast every other day with Hercules powder to keep it loose enough for the drag scraper to work. This pit is really only the beginning as the company owns 26 acres of good gravel land and hence has ample property for expansion.

A Sauerman Bros. 1-yd. drag scraper brings the material from the pit to a bar grizzly over the foot of the first conveyor belt. This scraper is operated by a Kern variable-speed hoist, manufactured by the Construction Machinery Co. of Waterloo, Iowa, which is driven by a 50-hp. Allis-Chalmers motor. The grizzly is made up of railroad rails spaced 6 in. apart. It is necessary to have two men at work at the grizzly removing or breaking up the larger stones.

Jaw Crusher Needed for Large Boulders

Mike Lachner, president of the company and plant superintendent, says that he proposes to put in a jaw crusher at this point to take the largest boulders, and with this in operation he can eliminate one or both of the men now working at the grizzly. At the same time he will be able to increase the capacity of the plant, which is now about 500 yd. per 10-hr. day, up to 700 yd. and even more than that.

Material passing through the bar grizzly is fed to the conveyor leading to the scalping screen by a Telsmith reciprocating feeder. The conveyor is Telsmith equipment and has an "Ajax" belt manufactured by the Hewitt Gutta Percha Rubber Corp. of Buffalo, N. Y. This material drops to a Telsmith scalper having holes 2 in. in diameter. The throughs pass at once to the conveyor which carries them to the washer, while the rejects drop to a Telsmith No. 8A primary breaker. The material from the crusher falls to the boot of a Smith Engineerings Works No. 4 bucket elevator and is returned to the scalping screen in a closed circuit.

The gyratory crusher is driven by a 50-hp. Allis-Chalmers motor and a belt from the crusher drive shaft turns another drive shaft from which the bucket elevator, the scalping screen and the conveyor from the grizzly are operated. These are driven through gears, through a chain drive and through a belt and bevel gears respectively from the shaft mentioned above. Also the feeder under the bar grizzly is operated from the tail pulley of the conveyor, thus likewise receiving its power from the same 50-hp. motor.

The conveyor from the scalping screen carries the material to the washing screen at the top of the tower, around which are the segregated storage piles for current withdrawal, which constitute the special feature of the plant, as well as ordinary stock piles to be reclaimed as needed. The conveyor is also Telsmith equipment with a Hewitt "Ajax" belt driven by a 15-hp. Allis-Chalmers motor.

The tower mentioned is octagonal in shape and about 15 ft. across inside. From each corner radiates a wall or fin stretching down to the ground and extending out about 40 ft. Between these fins the sized material is dumped. To reclaim it there are chutes from the inside corner of each of the "bins" which empty into a well at the base of the tower. These chutes deposit the material on the foot of a belt conveyor to take it to the loading hopper.

It can readily be seen that a large amount of material can be stored in these piles against the sides of the tower by simply letting the material fall from the sizing screen chutes. But this capacity can be more than doubled when the material is pulled out away from the tower to make room for more. Much larger storage is obtained in this fashion than could possibly be obtained by the usual method of overhead bins.

A dragline operation is used when necessary for moving the material out away from the center tower to make room for more, and also to move it back when enough of the pile has been removed to make it necessary to pull the outlying material back to the mouth of the chute. An unusual arrangement of a circular track around the plant is designed to carry the hoist for this scraper so that it can be readily moved around the plant from bin to bin. The scraper used for this operation is a Sauerman ½-yd. drag scraper, operated by a Kern

Drag scraper in pit

Drag scraper dumping to bar grizzly

hoist mounted on the small car which runs on the standard-gage circular track. A 25-hp. Allis-Chalmers motor is also installed on the car to drive the hoist. When operating, the car is anchored to loops of cable to counterbalance the pull of the bucket.

Material Drains 24 Hours

The actual gravity flow of the material to the various stock piles around the tower is approximately three cars in each bin partition before it is necessary to use the dragline scraper to bring in additional material. By this arrangement it is possible to allow the material to drain for 24 hours, which is required in some specifications, by depositing the material produced today in one bin and shipping the material produced yesterday from another bin. By this means, the operator is also able to get rid of any small amounts of clay in the material and re-rinse it before it is loaded, thereby keeping an absolutely constant content of moisture. In cold weather, by putting heat on the inside of the tower, it is possible to produce from 10 to 15 cars of heated material over night, ready for delivery the next day; and then by the use of the drag scraper, the frozen material around the tower can be piled in around the walls and thawed out.

In the beginning of operations only one-half the circular track was installed. A low place on the north side of the plant prevented the installation of the balance of the track, but the company filled in this place by a rather novel method, running its waste water into this depression, allowing the fine material to settle, and then pumping the clear water away. A pond was formed for damming, and into this the waste water flowed. At the other end a pump removed the clean water and pumped it back to the creek a quarter of a mile away. From this creek the original wash water is also pumped. An Allis-Chalmers centrifugal pump delivering 600 gal. per min. and driven by a 50-hp. Allis-Chalmers motor delivers the wash water to the plant, while another Allis-Chalmers pump of 400 gal. per min. capacity driven by a 10-hp. motor pumps the water away from the settling pond. Crane Co. valves and fittings are used.

General view of plant of Hillside Washed Sand and Gravel Co.

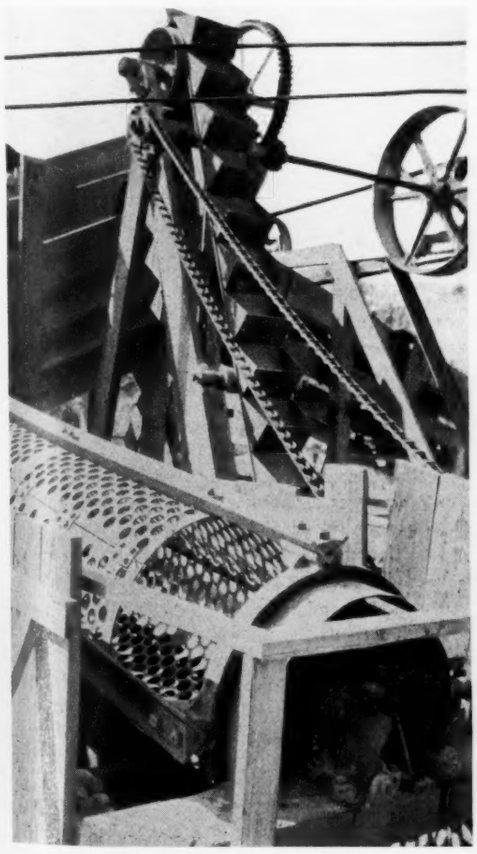
The wash water is delivered to a Telsmith Hercules sizing screen which separates to four different sizes. The first section is a scrubber section, followed by three jacketed sections. The size of the holes in the main screen is ⅝ in. for the first two sections and ⅛ in. by 1 in. rectangular for the first two jacket sections. From these jacket sections is obtained the sand which passes to a Telsmith sand tank for dewatering. From the third jacket section, having ⅜-in. holes, is obtained the pea gravel. The last two sections of the main screen have 1-in. holes for the 1-in. stone and the 2-in. size is obtained from the rejects of this screen. The washer is driven by a 10-hp. Allis-Chalmers motor.

Seven Bin Sections Used for Storage

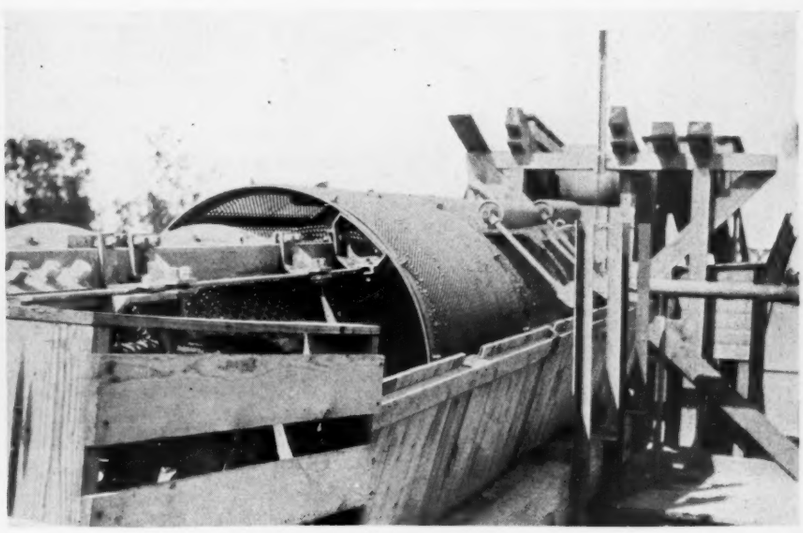
There are available seven sections of the octagon to which these four sizes of gravel are delivered by means of chutes. The eighth side of the octagon is open where the conveyor to the loading and batching hopper is placed.

The tower is constructed on a steel framework of I-beams set on concrete foundations. The sides are formed by filling in between the steel members with planks.

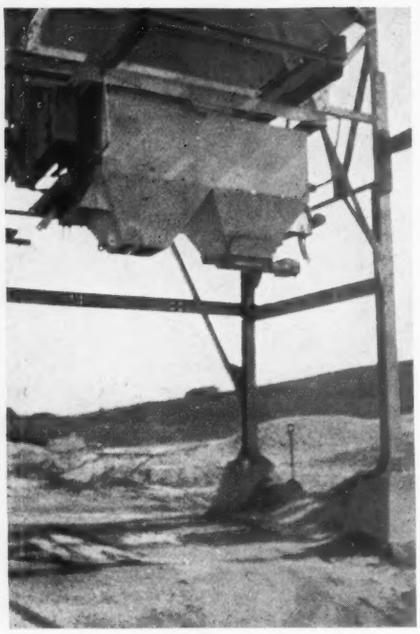
The material delivered to the belt at the base of the tower is carried to the Butler batching bin where it is weighed and delivered to the trucks. This bin's capacity is 40 yd., but Mr. Lachner recommended a larger size as being advisable to turn out



Scalping screen and elevator from crusher



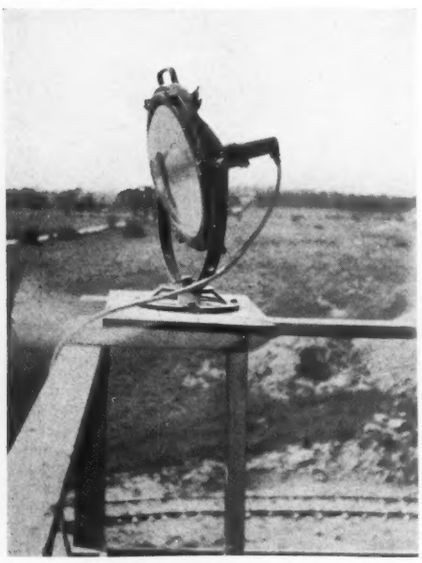
Sizing screen at top of plant



Arrangement under bins to permit either batched or free-running material to be delivered to trucks

a larger production from the plant. He thought a 100-yd. bin could be used profitably.

All shipping from this plant is by truck as there is no railroad at the plant. The material is used both for paving and for general building purposes. The company finds it profitable to reach some of the western edge of Milwaukee, but does not try to cover the whole city because of the length of haul. Muskego is some 18 miles from the center of the city so it is readily seen that to cover the whole territory would be unprofitable. Mr. Lachner estimated that a haul of from 15 to 17 miles would be the farthest his company cared to move its material. The company owns one Reo truck and hires ten or more other trucks, depending on the pressure of business. The whole layout is equipped for night operation with General Electric flood-lights installed at various points. Trucking goes on late into the evening, the plant delivering material to trucks as late as 10 or 11 o'clock.



Flood-light for night work

As at present operating, this plant requires seven men—two at the grizzly, and one each at the scraper, the crusher, the reclaiming scraper, the washing screen and the loading equipment. With the improvements suggested it is felt that at least two men can be eliminated.

The Hillside plant was designed by Fred T. Kern Co., consulting engineers of Milwaukee, and is similar to another plant designed by them near Iron Mountain, Mich. The design is covered by patents.

Three men make up the personnel of the Hillside company. Mike Lachner is president and he is also in active charge at the plant as superintendent. Emil Siegmund is the secretary with direct charge of the office of the company in the Plankinton Building in Milwaukee. Tom Felich, the other member of the company, is the sales manager.

Destructive Weathering of Roofing Slate

HOW A NATURAL ROCK composed mainly of inert minerals and possessing high strength as well as very low porosity is attacked by the weather is a problem of considerable interest to both producers and users of roofing slate. While slate roofs are commonly considered as among the most permanent types, there are instances where this material has not come up to expectations.

During the past year the National Bureau of Standards has studied this question with the particular object of devising specificational tests. The study of weathered slates from roofs, together with numerous tests, have indicated that the decay is due to a combination of chemical and physical processes. Frost action apparently takes very little part in the decay until the material has been considerably altered from its original condition by certain chemical transformations.

It is a well-known fact that decayed slate usually shows the presence of quite appreciable amounts of gypsum, although the fresh slate is practically free from this substance. Some investigators have accounted for the formation of gypsum in decayed slate by assuming that the small amounts of sulphuric acid in the air react with the calcite impurities. This may account for a part of the gypsum, but it has been proved that this substance can also be formed in some slates by merely soaking and drying them several times. The formation of gypsum during the weathering process affords a clue to the cause of decay and indicates that the mineral impurities concerned in the reaction are calcite and pyrite, the necessary oxygen to complete the sulphate radicle being drawn from the air. Apparently free carbon, which is usually present in slate, aids the reaction. The conversion of calcite to gypsum brings about expansive forces within the slate, since the gypsum molecule requires more space than the calcite molecule. Scaling of the surface of the slate results, and this action is practically always more pronounced on the covered portion of the shingle than on the part exposed to the weather. This peculiar condition is probably caused by water penetrating between the shingles during rains and the slower rate of drying there than on the exposed surface. Laboratory experiments indicate that the formation of gypsum within the slate does not occur when the material is continually wet and that periods of moist conditions alternating with periods of dry conditions are necessary to cause the reaction. Slates having only a small amount of calcite impurity are affected by this type of decay at a very slow rate. A very dense slate containing considerable calcite is not decomposed as rapidly as a more porous one with a similar calcite content. Some of our domestic roofing slates may be depended upon for more than 30 years of serviceable results, while others are apparently good for more than 100 years.—*Technical News Bulletin*, of the U. S. Bureau of Standards.

Cement-Sawdust Concrete

THE OREGON STATE COLLEGE experiment station at Corvallis has just issued a new bulletin dealing with "The Properties of Cement-Sawdust Mortars," the result of research work carried out by R. H. Johnson, fellow in the experiment station under the direction of S. H. Graf, professor of mechanics and materials. P. M. Brandt, chief in dairying at the college, points out in a foreword in the bulletin that this new material is of special interest to the dairy industry.

In this mixture sawdust is used in the place of sand with the cement, having all the sanitary qualities required of any cement plus lasting qualities and the additional factors of eliminating coldness which is dangerous to animals lying down and of extreme heat conductivity. By this new process a concrete floor practically as warm as a wood floor is possible with the unfavorable qualities of sand-concrete for dairy barns absent.

The addition of 1% by weight of diatomaceous earth was found to increase strength and reduce the heat conductivity of the cement sawdust mixture. It is necessary to use such a high percentage of cement, however, that in spite of the low cost of sawdust the total cost of this material will be slightly higher than where sand is used. It is therefore recommended only where light weight or warmth are major factors.

Crushed Stone Research Reviewed

By Edmund Shaw
Contributing Editor, Rock Products

IN HIS REVIEW of the research work carried on in the National Crushed Stone Association laboratory during the past year (published in the January 17 issue of Rock Products) Mr. Goldbeck has said about all that could be said in a general way. But on reading the report that he delivered at the annual convention I note many interesting details that he omitted, possibly for lack of space, about which I should like to write and comment.

One of the most important of these researches, important from the point of its effects on specification making, is that on the effect of flat and elongated pieces in concrete. In his review Mr. Goldbeck points out that the definition of a flat varies widely.

What Is a Flat Piece of Aggregate?

A fairly common definition is that a flat is a piece with the least dimension one-fifth or less of the greatest dimension. But he says that in one state a flat is a piece with the least dimension one-third of the greatest dimension. A specification barring any substantial percentage of such pieces would put many a gravel deposit that has been producing perfectly satisfactory coarse aggregate for years out of business. Which shows how little real knowledge of aggregates there may be with the people who buy and use them and how, too often, a prejudice or a whim is a sufficient ground for turning down a good product.

Not many stone producers have to meet this problem of flats, if they are crushing from a clean ledge of limestone or trap rock. The sample Mr. Goldbeck tested was of gneiss, a rock considerably used as an aggregate in some southeastern states, an excellent aggregate although it may break slabby. Being structurally sound, the flat shape of such pieces could not materially affect the strength of concrete made from them.

In limestone deposits the flats that may be included in the products may come from thin seams of slate and shale. Such pieces are not very strong, structurally, and they are often accompanied by clay and dirt. Structurally unsound flats are also found in certain sand and gravel deposits. It is easy to see how a prejudice against flats might come from finding these in the product, and that this prejudice might hold against flats that are structurally sound.

The reader may remember that Stanton Walker, of the National Sand and Gravel Association, studied the effects of flats on the strength and finishing quality of paving concrete. I have just read Mr. Walker's article and note the differences between his work and Mr. Goldbeck's and the conclusions drawn by them. So far as the conclusions go there is agreement on the main facts. Both found that flat pieces up to 14 or 15% did not decrease the strength of concrete in a 1:2:3½ mix, and both found that flats of themselves gave no trouble in finishing. They also found that flats did not tend to lie on the surface more than particles of other shapes, so that there was no greater danger that they would break out and leave pits than there was with other shapes.

Editor's Note

IN this article Mr. Shaw not only gives data from the research work of Mr. Goldbeck in the laboratories of the National Crushed Stone Association, in addition to what has already been placed before our readers, but he analyzes the bearing of this information on the industry, and discusses some of the new lines of research which it opens up. It is said that every discovery serves to lengthen the frontier line of our unexplored regions. In the matter of soundness of materials and mortar, for instance, Mr. Shaw points out that the work we have done is so inconclusive as to show us that there are contributing factors which we do not yet understand.

Differences in Two Groups of Tests

However, beyond these fundamental things there are some noticeable differences in the tests. Mr. Walker not only tested the concrete but he tested the aggregate for wear and for soundness. As the reader may remember, he found that the wear was increased when flats were added. This was to be expected because the wear test was that which uses iron balls, which would naturally break up the flats. Still the wear was only increased from 6.5% to 9.9% by the addition of 30% of flats. As no differences in strength resulted from the presence of flats one may take this as another indirect proof that there is no connection between wear and the concrete-making qualities of an aggregate. He also tested the aggregates with flats added by the proposed method of test for soundness in which the particles are first soaked in sodium sulphate and then ground in the Deval machine. The curious thing in this test was that both round and flat particles showed less wear after treatment with sodium sulphate than they did without treatment. As the gravel tested was a mixture of miscellaneous rock types this is somewhat surprising.

Mr. Walker tested only one gradation in the slab. Mr. Goldbeck tested three gradations, fortunately. The material for all three passed 2¼-in. and practically all of it remained on ¼-in., all sieves having round openings. The first gradation was "straight line," the second was not so far from it, while the third was decidedly deficient in finer sizes. This gave it a low unit weight and a high percentage of voids. The effect of grading on weight and voids is so well shown by these examples that I have copied them.

TABLE I—GRADATIONS OF STONE USED
(Round Openings)

	No. 1	No. 2	No. 3
Total passing 2½-in.	100%	100%	100%
Total passing 1½-in.	72	82	79
Total passing ¾-in.	30	27	14
Total passing ¼-in.	2	1	0

TABLE II—WEIGHTS PER CU. FT. AND PER CENT. VOIDS
(Dry and Loose)

	Gradation	Pct. flats	Weight per cu.ft.	Pct. voids
Cement	.....	....	94.0	.....
Lime	.....	....	40.0	.....
Sand	.....	....	94.7	42.5
Stone	No. 1	0.0	95.1	47.2
	No. 1	5.0	94.3	47.6
	No. 1	10.0	92.5	48.6
	No. 1	15.0	92.7	48.3
	No. 2	5.5	87.7	51.3
	No. 3	0.0	88.7	50.8

Notice from the second table the little effect of flats on the percentage of voids when they are added in increasing quantities. With 15% of flats the voids were increased from 47.2% to 48.3%. One would have expected to see even this slight difference reflected in the cement content, but there was no effect, to judge from the table showing the mixes. Both the cement factor and water-cement ratio were kept constant and the slump was "as nearly as practicable" at 1½ in.

The effect of this poor gradation (No. 3) and high voids was very marked and it is thoroughly discussed in the paper. It is shown that the relation of the volume of mortar to the volume of voids for No. 1 gradation and zero flats was 1:1.34, while with the No. 3 grading, without any flats, it was as 1:1.22. When flats were put in to the amount of 10% the mortar-voids ratio with No. 1 gradation fell to 1.30 and with No. 3 gradation to 1.15. The latter one would think to be very close to an unworkable mix, the amount of mortar being so small that it would be easy for coarse aggregate pieces to rub on one another. And this appears to be what happened in finishing. The photographs which accompany the original of these tests showed that this No. 3 gradation with or without flats did not finish at all well.

The importance of having a sufficiently high mortar-voids ratio becomes increasingly clear as this and other recent tests are studied. Mr. Goldbeck was one of the first of present-day investigators to call attention to it. The writer well recalls hearing him impress upon his hearers at a convention of the National Crushed Stone Association the necessity of seeing that sufficient sand was used with their product. Not more cement and not more coarse aggregate but just sand, is the way he put it, and he showed that the mix would be more plastic and might test higher in compression, without added cement, if sufficient sand were used.

The strength tests were practically equal for all gradations and with contents of flats up to 15%. This seems to confirm the conclusion drawn by Mr. Goldbeck in his tests on gradation, by Mr. Waker in his recent paper and tests made in the past two years, and by Mr. Kellerman in his Bureau of Public Roads report, that there is no consistent relation between the gradation of coarse aggregate and the strength of concrete. So this is one point in aggregate research that may be taken as proven, always provided that only such gradations as would be found in ordinary plant products are referred to.

The removal of the prejudice against flats means a great deal to the aggregate industry, and more perhaps for the gravel industry than the crushed stone industry. It also means much to the future of the aggregate industry, because there are deposits of good material that would have been worked before now if it were not for the flats they contained. With so many of our deposits being depleted, any research that adds to the number of available deposits is important to the country.

Effect of Stone Dust

Last year's report gave the effect of stone dust in the 28-day strength of concrete as determined in the laboratory of the association. It will be remembered that three different kinds of rock were tested, limestone, trap and gneiss. For all three the decrease in strength was practically negligible, being from 1% to 1½% decrease in the modulus of rupture for each per cent. of stone dust, the percentage being based on the weight of the stone. Regarding the effect of stone dust this 1931 report says:

"As will be noticed in the report of the committee on the mechanical elimination of dust from crushed stone, there seems to be a general consensus among engineers throughout the country that stone dust is to be regarded as a deleterious material and that it is better to eliminate this dust as far as practicable. In the case of stone used as a concrete aggregate, this opinion of engineers may or may not be well founded. Certainly, our tests show that it is not well founded and it may be the case that engineers have passed this opinion on from one to the other in much the same way that they frequently copy specification limits from one specification to another, without giving the matter further thought."

But Mr. Goldbeck in his review for Rock Products wisely says that the investigation could be extended to a wide variety of rocks for there may be exceptions to the above cited results. It is possible of course that the specifications limiting dust may have no deeper foundations than those limiting the flats and elongated pieces. But it hardly seems possible. One would more likely think that the prejudice came from using stone which is not merely dusty but actually dirty, that is, containing considerable proportions of clay and loam, and the bad effect of these on concrete is well enough known.

Soundness Test

Mr. Goldbeck's researches on the soundness of aggregates go as deeply into the subject, or deeper, than anything which has been published. Hence, what he says about the soundness test is of great interest.

The sodium sulphate test is passed over with a brief paragraph or two. Those interested may remember that Mr. Goldbeck made a thorough investigation of this test and published a report on it in the July, 1929, issue of the *Crushed Stone Journal*. He outlined a standard method for the test, differing from that given in the recent research report of the National Sand and Gravel Association only in that it was not so complete or detailed. But Mr. Goldbeck prefers the freezing and thawing test to the sodium sulphate test for reasons he gives in the articles referred to and in his report. They are good reasons, but there also are reasons for retaining the test, according to Dr. Kriege, and some other investigators, who point out that the test more or less closely parallels the disintegration of concrete by physio-chemical effects that are now being studied.

But this is only one fact that shows, as Mr. Goldbeck says, "that testing for soundness is in a state of chaos, and this is bad from the standpoint of both the producer and the consumer."

He shows that it is by no means simple to say just what needs to be tested and how it shall be tested. Of course it is the soundness of concrete that is wanted and nobody cares particularly whether the aggregate is sound by itself so long as it makes sound concrete. But unsound concrete, as the report points out, may come from faulty cement or too much water as well as from unsound aggregates. So if the concrete is unsound the aggregates should not be blamed until it is shown that the cement and water ratio were all right.

The report asks if the character of the accelerated soundness test should not be varied with the degree of exposure of the rock in service. Also it asks if we need as severe a soundness test in the frostless sections of the United States. Common sense would seem to say that we do not.

Unsoundness of Concrete Due to Free Water

It seems to the writer that the series of tests which are described in this report have made a considerable step toward bringing order out of chaos by definitely linking unsoundness to free water in the concrete. This is water which does not combine with cement but remains in the concrete as water pores. They may dry out leaving open pores, but these will fill again while the concrete is in service. If water freezes in these pores there will be shown the same disruptive effect that is shown when the water pipes in a house burst. The details of the test are so interesting that they are worth reviewing somewhat fully.

The start of studying the whole matter of soundness has been made by freezing mortars mixed 1:1, 1:1½, 1:2, 1:2½, and 1:3, by volume. And the water ratios of each of these were varied as follows: 0.63, 0.70, 0.77, 0.84, 0.91, 0.98. The sand used was ordinary Potomac river sand, with fineness modulus from 2.73 to 2.76.

To the writer the important things in the report are this table of free water and the discussion which follows.

PER CENT. FREE WATER IN MORTAR MIXTURES

$$\text{Per cent. free water} = \frac{\text{Weight immediately after molding minus oven dry weight}}{\text{Oven dry weight}} \times 100$$

W/C	1 Neat cement	2 1:1	3 1:1½	4 1:2	5 1:2½	6 1:3	
0.63	21.5	10.9	8.9	7.3	8.8	11.3	A
0.70	24.4	13.0	10.4	8.3	7.2	9.8	B
0.77	27.5	14.9	12.1	10.3	8.6	8.0	C
0.84	29.6	15.6	12.7	11.2	8.8	7.8	D
0.91	29.8	17.6	14.7	12.5	9.6	8.9	E
0.98	32.6	18.6	16.0	13.5	11.5	10.4	F

The report says of these results:

"The table shows that the neat cement specimens had very high percentages of free water and those specimens disappeared from the test at the end of ten alternations of freezing and thawing. They had completely disintegrated at that period. It was seen that the higher the percentages of free water, the more completely had disintegration taken place in practically all of the specimens. The 1:3 specimens, in general, have a comparatively low percentage of free water and they stood up remarkably well. The 1:2½ mortar series is interesting in showing that the particular specimens which show the worst disintegration had the very highest percentage of free water, that is specimens 5-6 with a water ratio of 0.98.

"From this study it seems to be very strongly indicated that the free water controls the durability of mortar, certainly within the range of this particular investigation."

In one way the test did not reproduce practical conditions. The neat cement and 1:3 mortars were given the same water ratio, so of course the consistency had to vary. Regarding this the paper says:

"It might be objected by some critics that rich mortars are those which ordinarily stand up in service much better than lean

mortars and, in general, this is perfectly true and in this sense seems to contradict the results of Series I. On the other hand it must be remembered that when concrete is made for structural purposes it ordinarily is made to a given consistency and it requires much less water in a rich mix than in a lean mix to make concrete of the desired consistency. Therefore, in service, rich concretes are apt to have a low water-cement ratio as compared with lean concrete.

"In the present series of tests, on the other hand, all of the mortars had exactly the same range of water-cement ratios; therefore, they did not have the same range of consistencies. The neat cement and the rich mortars, for illustration, were almost of a soupy consistency, whereas the 1:3 and the 1:2½ mortars varied from the dry to wet but they were not soupy. Had these mortars been made to a given consistency as in service, in all probability it would have been shown that the rich mortars were more durable than the lean mortars."

Soundness of Sand and Coarse Aggregate

A second series of tests was made in which specimens were cured in the moist room and then air, finally being soaked for one day before testing. In a third series the specimens were cured continuously in a moist room. The paper does not note that there was any particular improvement and durability due to either method of curing, but these tests did incidentally bring out what is perhaps the most curious and most interesting fact of these soundness tests.

The sand from which these mortars were made (Potomac river sand) withstands freezing and thawing and the sodium sulphate test without disintegration. Hence, it is quite possible to have disintegration of mortars and concrete with fine aggregates which are themselves sound. It is also possible to have sound mortars made from sand that is unsound, as the following tests show.

A glacial sand was tested by freezing and thawing and found to be unsound. This sand was then made into mortar specimens with a 1:2 mix and a water ratio of 0.70, which is quite commonly used in concrete work. These were cured for 14 days in moist air, in the laboratory air for 12 days, then partially immersed in water for two days, after which they were given the freezing and thawing test. Note that the manner of testing corresponds in every way to what might be the normal conditions under which concrete would be made and placed in the field.

Every one of these specimens was practically sound after 50 cycles of freezing and thawing, but after 70 cycles two showed some chipping. The report says: "Even after 70 cycles of freezing and thawing these samples made with so-called unsound sand were incomparably better than those made with Potomac river sand supposed to be sound. If these tests are at all indicative, they show that the durability of sand is not necessarily an indication of the durability of mortar."

More to Unsoundness Than We Know

If sound sand may make unsound mortar and unsound sand may make sound mortar, as it did in these tests, where does it leave us? There is indeed the necessity for deeper investigation of the causes of unsoundness that the report points out.

One series of these soundness tests throws some light on the question of how far the soundness of concrete is affected by the unsoundness of the coarse aggregate. A stone which was very badly disintegrated with 50 cycles of freezing was made into concrete and the concrete given 85 cycles of freezing and thawing. The mortar disintegrated and separated from the stone leaving the stone projecting, showing that the stone was at least as sound as the mortar. With further freezing the stone flaked off where it was exposed, but it did not break the concrete or cause pitting.

Another test of this kind was made on concrete which had failed at the end of one year. In this case it was particularly desirable to know whether the stone was at fault or not, so the stone was cleaned from the mortar. Then the stone and mortar were tested separately. The mortar utterly disintegrated by freezing and thawing while the stone remained sound, showing the stone had not been at fault. It is unfortunate that, as the report states, the sand and cement used in the mortar were not available so that they could be tested separately.

Indications Worthy of Note

Although to the ordinary reader it would seem that these tests would justify fairly definite conclusions, Mr. Goldbeck cautiously says only that "there are certain indications which are worthy of note." These are:

1. Sound portland cement, when mixed with water, in water ratios of 0.63 to 0.98, is not always a sound material when subjected to freezing.

2. It is possible for rich mortars to fail and lean mortars to possess a good degree of durability. Also the reverse of this is true. [From the tests, one would judge this a matter of water-cement ratio.—Editor.]

3. Tests indicate that it is possible to have an unsound mortar with a sound sand and a sound mortar with an unsound sand, each having the same water-cement ratio.

4. Coarse aggregate, even though in some cases unsound, does not necessarily make for unsoundness in concrete. The unsound stone tested did not crack the concrete, nor did the stone leave the concrete and cause pitting. Only after the mortar failed did the stone fail by continuous chipping.

5. The cementing medium, composed of portland cement and water, seems to be the most important element in durability.

It is difficult to place too high a value on the results of tests and these conclusions, because, as the report says:

"Durability tests on aggregates and on concrete may be the most important tests that can be made on structural materials today. Our investigations and those of other laboratories with respect to durability have only begun. There remains much to be discovered and particularly is it important to obtain facts that will permit of writing specifications for aggregates and for concrete which will insure their durability."

Expansion and Contraction of Concrete

The expansion and contraction of concrete is a subject which has just begun to receive the attention it warrants in the past four or five years. The work of Prof. White of the University of Michigan and that of Prof. Davis of the University of California have shown how important volume change may be in determining the durability of our concrete structures. Mr. Goldbeck's report gives a good summary of the causes that make for volume change in concrete:

"When moisture drys out of concrete, shrinkage takes place just as in the case of decrease of temperature. When moisture is absorbed by the concrete it swells. All concretes are not affected in like manner due to the absorption of moisture, and there are a number of different factors which control the amount of the swelling or shrinking. One of these is the richness of the mix and still another is the age of the concrete. In practice, there seems to be some indication that the type of aggregate might have some effect on the shrinkage of concrete."

Mr. Goldbeck notes that it has been his observation that light slags appeared to cause excessive expansion in the presence of moisture. So he tested the expansion of concrete made with these as compared with concrete made from limestone and from medium weight and heavy slags. The details of the test are rather interesting if one is not familiar with the procedure. The specimens were 10 in. long, broken from 6x6-in. beams of concrete. One piece was broken off at 29 days and another was broken from the same piece after two months' storage and compared with it. Brass plugs were set in the ends to give a correct surface for measurements and the lengths were measured by a strain gage which would measure accurately to 0.0001 in. Temperature errors were corrected by measuring a bar kept immersed in ice water.

By using this method it was found that the light slag concrete expanded 0.00049 in. per inch of length, which was 81% more than the limestone concrete expanded. The medium weight slag expanded slightly less.

The light slag weighed less than 70 lb. per cu. ft. (In the Rock Products article the weight is given at 59.7 and 57.8 per cu. ft. which would bar it from use as aggregates by most state highway specifications.) The medium weight slags weighed from 70 to 80 lb. and are those ordinarily

used as aggregates, the heavy group (over 80 lb.) not being available in large quantities.

Mr. Goldbeck notes that a slag which had the right weight per cubic foot might be made up of particles of very heavy slag and very light slag. The very light pieces in such a mixture might be in sufficient quantity to cause undue expansion of the concrete.

At the end of the expansion tests the specimens were wet and frozen. They all showed shrinkage, and the shrinkage of the limestone concrete was the greatest. The report says:

"Most of the blow-ups occur in concrete roads during the spring of the year when there is the combined expanding effect of moisture in the concrete and high temperature. Later on in the summer, as the moisture is evaporated, notwithstanding the possibly higher temperatures which exist, many of these blow-ups recede and the road settles back into place in many places. Because of the combined effect of moisture and temperature in expanding concrete it was felt advisable to study this phenomenon as it may be affected by the characteristics of the coarse aggregates."

To simulate the spring weather effect the specimens were measured at 80 deg. F., then kept in water of this temperature until uniformly heated and then measured. The measurements showed the coefficient of thermal expansion was about the same for all coarse aggregates. Then the specimens were frozen solidly for 24 hours and measured. The average coefficient for all the specimens was approximately 0.0000048 in. per deg. F. The report says that no conclusions are warranted; but the greater expansion made with light slag may account for some of the serious blowups which have occurred in concrete roads made with slag aggregate and concrete bases made with this type of aggregate. It adds:

"One important fact to notice is that frozen concrete shows no expansion due to the expanding force of the ice within the pores. On the contrary, normal contraction does not seem to have been altered in the freezing."

Investigating Bituminous Construction

The report says that a start has been made with investigating stability of bituminous mixtures. It is difficult to develop a suitable device for determining stability. The report states:

"It is the general feeling that lack of stability occurs in mixtures which have low internal shearing resistance and efforts have been made to develop tests which measure the resistance to internal shear."

The convention was shown the device and the report says of its operation:

"The specimen was made on the Bureau of Public Roads roller type of machine which compresses the bituminous concrete mixture under the rolling action of a roller of given weight, simulating as nearly as possible the rolling actually received in construction work. The specimen is 2¼ in. thick, 4 in. wide and 8 in. long. The load is applied by the means of a general testing machine and the maximum load which the specimen will withstand is taken as a measure of the resistance of the specimen to internal shear. This, of course, is an arbitrary measurement which is meaningless except when compared with load measurements made on other specimens. The most that can be said for this test at the present time is that it looks promising, but that a lot of work must be done before it will be possible to determine if the test is really suitable."

Prevention of Segregation

From the ordinary producer's viewpoint there is probably no part of the investigation which is of more immediate practical benefit than the study of segregation, because, as the report says:

"Every producer of crushed stone no doubt at some time or another has experienced trouble with the rejection of his material because it is claimed that it is improperly graded. The producer had combined the various sizes in the right proportions, but segregation had taken place in loading the bin and also in loading the car from the bin. When material is run in a single stream and piled up in the form of a cone, it naturally segregates, the fine particles remaining at the center of the cone and the coarse particles running to the outside. The reason for this probably lies in the fact that the finer material falls into voids in the surface of the cone and the coarse material, being too large to fill the voids, rolls on down the pile until it meets with obstructions which prevent it from rolling farther.

"A considerable amount of work has been done looking into various schemes for preventing segregation, including the use of dividing wedges and swinging gates. Any device which will prevent the material from piling up in the form of a cone but which will distribute it uniformly across the width of the car will prevent segregation in a lateral direction of the fine and coarse particles and one of the most successful means thus far developed consists merely of a single plate suspended at its third point from the top and held immediately in the center line of the stream of falling stone. This plate is swung by hand from side to side and thus the stone is caused to flow first to one side of the car and then to the other and thus it piles up in the form of a pyramid rather than in a cone. The fine material is thus distributed entirely across the width of the car and the lateral segregation is entirely eliminated. It is fully believed that if the producing plants would pay more attention to the prevention of segregation in their loading operations they would have less difficulty with rejections than is the case at the present time."

Items not touched upon in the report delivered to the convention but mentioned in the printed report of the Bureau of Engineering of the association are the gradation of stone sand and tests of workability. Of the first the report says that the results of tests permit tentative conclusions to be drawn. This is a matter of considerable interest to stone producers. The laboratory of the France Stone Co. is also making a study of stone sand gradation.

Miscellaneous Matters

As to workability, the report says that tests of the workability of various gradations by slump test, flow table and operator's judgment have shown gradations which seem to give the easiest workability. Results are to be published shortly.

The report notes another matter extremely important to producers of railway ballast. Tests made on rock for ballast purposes brought out inconsistencies in some of the specifications for ballast. The report says:

"We find, for example, that the present limits for cementing value as suggested by the American Railway Engineering Association are entirely too small, and that they should be increased to a very considerable extent if any rock is to be used for ballast at all."

The report closes with the following notes of the work on hand and proposed for the laboratory:

"It may be interesting for you to know that within the fields in which crushed stone is used, including highways, building construction, railroad ballast, trickling filters and miscellaneous purposes, some 38 important research projects have been outlined for our laboratory."

Profit in Sand by the Bushel in Los Angeles

A LARGE painted sign extending from the building front to the sidewalk curb tells the passing public that the Herzog Lumber Co., Los Angeles, Calif., sells two bushels of sand for 45 cents. As a result, it sells considerable sand. No, that is not a "delivered" price. The purchaser is supposed to take the sand away himself, or pay a small additional charge for having it delivered.

The product is sold to persons for various uses ranging from a bit of cement work to a sand-box for the baby to play in. Where needed for small patching and cement jobs the service is quite a convenience to customers, especially in a thickly settled region where it would be a nuisance to have more of the material on hand than is needed, and where it would otherwise be difficult to obtain it without traveling considerable distance.

The possibilities of selling sand in small amounts were accidentally discovered, and so profitable did they appear that the management decided to advertise it; hence the big sign across the sidewalk.—*American Lumberman.*

Researches on the Rotary Kiln in Cement Manufacture†

Part XIV—Flame Temperatures Obtained in Practice in the Cement Rotary Kiln

By Geoffrey Martin

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THE HIGH THEORETICAL flame temperatures calculated in Part XIII are never obtained in practice.

The following table shows the actual flame temperatures prevailing in kilns as measured by various observers:

OBSERVED FLAME TEMPERATURES OF ROTARY KILNS

Works	Observer	Method of observing	Flame temperature
No. 9	B.P.C.R.A.	Optical pyrometer	2759 deg. F. (1513 deg. C.)
No. 10	B.P.C.R.A.	Optical pyrometer	2692 deg. F. (1478 deg. C.)
No. 11	B.P.C.R.A.	Optical pyrometer	2536 deg. F. (1391 deg. C.)
No. 26	B.P.C.R.A.	Optical pyrometer	2835 deg. F. (1557 deg. C.)
Rudersdorf (1923)	Prof. Nacken[1]	Pt-Rh-thermocouple	2606 deg. F. (1430 deg. C.)
Lehigh Valley (1905)	E. C. Soper[2]	Pt-Rh-thermocouple	2587 deg. F. (1420 deg. C.)

[1]*Prof. R. Nacken, Protokoll der Verhandlungen des Vereins Deutscher Portland-Cement-Fabrikanten* (E.V.), Charlottenburg, 1921, p. 184.

[2]*E. C. Soper,* "Report on a Test of a Portland Cement Plant," *Engineering News,* 1905, liv., Nr. 25, p. 664.

Of these results, probably those of Professor Nacken are the most accurate, as they were determined with the greatest possible precision, and will be taken here as the *mean flame temperature* prevailing in an ordinary rotary kiln. The optical pyrometer registers the temperature of only the hottest portion of the flame, and so tends to give high values. The theoretical flame temperature attainable with air preheated to, say, 400 deg. F. is 3977 deg. F. (2172 deg. C.).

Reasons Why the Practical Flame Temperatures Fall Short of the Theoretical Flame Temperatures

The reason why the theoretical flame temperature is not attained in a rotary kiln will be obvious from the following considerations:

Suppose the rotary kiln is producing, say, W tons* of clinker per hour with a coal consumption of C tons* per 100 tons* of clinker.

Suppose that a rotary kiln is consuming C *tons** of coal per 100 tons* of clinker and is producing W tons* of clinker per hour.

Then, in 1 hour $\frac{W \cdot C}{100}$ tons* of coal are burnt, and in 1 sec. $\frac{W \cdot C \times 2240}{100 \times 3600}$ lb. of coal are burnt, or 1 lb. of coal is burnt in:

$$\frac{3600 \times 100 \times 1}{2240 \times W \cdot C} \text{ sec.} = \text{say, } t \text{ sec.}$$

Hence, in t sec. 11.278 lb. of combustion gas are produced by the burning of this coal; t is a time peculiar to each kiln working under constant circumstances, being *the time in seconds required to burn 1 lb. of coal.* This time is of vital importance in the theory of the kiln. The *larger* the *kiln,* the smaller the t.

Now let us follow the history of this 11.278 lb. of gas in the clinkering zone. Suppose that the 1 lb. of coal is supplied with 10.478 lb. of air preheated to, say, 400 deg. F. and placed in an insulated enclosure and allowed to burn, the time of combustion being t sec., as above described. Then under the circumstances the 11.278 lb. of gas will rise 3977 deg. F.—the theoretical flame temperature appertaining to air preheated to 400 deg. F., as shown in Table III, Part XIII. But in the actual kiln this 11.278 lb. of gas is losing heat for the whole t sec. (by radiation, conduction and convection), and the total amount of heat lost in this time is such as to reduce its temperature to, say, 2600 deg. F. (instead of the theoretical 3977 deg. F.), as shown by Nacken.

Table II, Part XII, allows us to calculate this loss of heat. The *instantaneous specific heat* of the gases of combustion at 3977 deg. F. is $0.3426 + 0.77 \times 0.0031 = 0.3450$. The *instantaneous specific heat* of the gases of combustion at 2600 deg. F. is 0.3071. So that the mean specific heat of the gases of combustion between 3977 deg. and 2600 deg. F. is:

$$\frac{0.3071 + 0.3450}{2} = 0.3260.$$

Hence the amount of heat lost by radiation, conduction and convection by 11.278 lb. of gas in t sec. is:

$$11.278 \times 0.3260 \times (3977 - 2600)$$
$$= 11.278 \times 0.3260 \times 1377$$
$$= 4836 \text{ B.t.u.}$$

So that the percentage loss of heat on the total heat of combustion is:

$$\frac{4836 \times 100}{12600 + 828} = 36.1\%.$$

Where is this heat going to? It is a constant loss going on steadily in a kiln. It is going to (1) maintain the walls of the kiln at their constant temperature in spite of radiation loss, *i.e.,* compensate the radiated losses from external walls (external radiation); (2) much is radiated from the hot flame down into the cooler parts of the kiln; (3) part is communicated by conduction and convection to the material in the clinkering zone.

(1) is utterly wasteful; (2) and (3) can be usefully employed under limitations.

These questions will be dealt with later. They are of vital importance in the design of the kiln.

Since the *clinker* at the clinkering temperature tends to *evolve* heat rather than absorb it, the *practical* flame temperature is not much lowered at its initial point owing to the formation of clinker by absorption of heat, and so it comes about (as we shall see) that we can in practice calculate with a fair degree of accuracy the amount of clinker turned out of a flame sinking through different temperatures.

(To be continued)

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*Tons in every instance are British tons of 2240 lb. To convert to American tons of 2000 lb. multiply by 1.12.

Silica Rock Plant Burned

FIRE of unknown origin destroyed a silica rock crushing plant, storage bins and a garage of the Highland Sand Co., near Reading, Penn., February 19. William H. Fisher, president of the firm, said the loss was about $30,000.

Georgia Activities in the Rock Products Industry

By Walter B. Lenhart
Associate Editor, Rock Products

Plant No. 2 of Georgia Limerock Co. At the two plants of this company at Perry, Ga., all views on these two pages were taken

THE STATE OF GEORGIA recently passed a 6-cent gasoline tax, which incidentally is said to be about the highest of any state in the Union. The funds derived from this tax are to be used for highway construction and have been the immediate cause of considerable activity in the aggregate producing sections of the state. So far most of the money derived from this fund is being spent in the northern and northeastern sections of the state. Very little activity is being encountered in the western and southern portions of the state.

In the eastern section of the state, some 30 miles west of Augusta, the Weston and Brooker Co. has recently completed a 3000-ton per day granite crushing plant that ranks it among the South's premier rock-crushing operations. At Perry, south of Macon, the Georgia Limerock Co. is constructing a second plant for the preparation of limerock for road-building purposes. It is also rumored that it will shortly start construction of a third limerock plant. The No. 2 plant of this company, illustrations of which are shown here, like all of the limerock plants in the south, is a comparatively simple operation consisting of stripping and light blasting operations (for the material is quite soft), loading and crushing. For the crushing the new plant uses a 28-in. by 56-in. set of Ocala Iron Works single slugger roll crushers and a secondary set of 36-in. by 48-in. rolls of the same make. Bar grizzlies are located ahead of both crushers, so that all fines will pass approximately a 2-in. spacing; although, owing to the nature of the product, all of the crushed material is much finer then that would indicate. Plant No. 2 of the Georgia Limerock Co. is being constructed on the Southern railroad at Perry and is immediately behind the cement plant of the Pennsylvania-Dixie Cement Corp. J. Williams, son of the president of the company, J. H. Williams, is superintendent of Plant No. 2 of the Georgia Limerock Co., Perry, Ga.

Crawler Trucks for Stripping

A model 600, P. and H. dragline is being used for stripping at present. Later it is expected to move in a new 1¼-yd. Bucyrus-Erie gasoline shovel for loading.

At the No. 1 plant of the Georgia Limerock Co. they have been experimenting with different types of crawler-mounted trucks for handling the stripping. The disposal of stripping from these Georgia operations is quite a serious problem, especially during wet weather, for the top soil contains considerable kaolin and is extremely soft and slippery. The topography of the surface is

Stripping experiments being made at No. 1 plant of the Georgia Limerock Co.

Other views of experiments in stripping methods at Plant No. 1

also very rough and uneven, and in the past stripping has consisted of back casting with drag-lines; but as the areas exposed at present have reached considerable proportions it is becoming necessary to permanently dispose of this spoil.

At the time of my visit the Georgia Limerock Co. was trying out a Koehring "Dumptor." This is an unusual type of crawler-mounted haulage equipment having two 10-20 McCormick-Deering gasoline engines for propulsion, and so constructed that selective steering can be done by means of the throttle, speeding up or retarding either one of the two engines, or by means of the clutches. The dump body holds 5 yd. (water measure) and 7½ yd. during normal operations. The truck-tractor has a normal speed in high of 3¾ miles per hour; in second 2½ miles per hour; in third or low 1⅜ miles and in reverse 1⅞ miles. Gasoline consumption, 35 to 37 gal. per day.

At the same time an Allis-Chalmers Monarch 35-hp. tractor was being used on trial, pulling a Euclid Crane and Hoist Co. trailer of the type shown in an accompanying illustration. The outcome of these trials will be of considerable interest to all operators of similar quarries or gravel pits.

Plant No. 2 under construction

Gravel Byproduct of Barite Production

In the Cartersville section the Thompson-Weinman and Co. recently installed a 375-hp., General Electric, hydraulic turbine generator set to supply power for its limestone pulverizing and grinding plant. A dam across the river just above the plant supplies all the water power necessary to run the operation. This company grinds whiting, barites and other minerals, using both wet grinding and dry grinding processes. In the wet plant Hardinge conical mills in closed circuit with Dorr thickeners are used, and for the dry pulverizing Raymond mills are used. The company has recently installed the new single-tube type of bag packer that the St. Regis Paper Co. is developing. In this type of packer the propeller instead of rotating in a vertical plane as in the Bates packer, rotates in a horizontal plane. The motor is mounted below and is direct-connected to the propeller shaft. For single-tube operations it makes a very compact unit. The Thomson-Weinman and Co. are also producers of gravel, which is in reality processed (washed) material from the stripping of the barites pits. An aerial tramway connects the pits in with the grinding plant and gravel shipping bins.

Cement Building a Continuous Process

At the Pennsylvania-Dixie Cement Corp. plant, Clinchfield, a building program continues, and while no particular item in the construction work is of any great magnitude, the work will be a "bit here and a bit there," covering a three-year period. In the packing plant a new type of packer supplied by the Bates Valve Bag Co. is being installed. In this new packer, when once the predetermined weight has been put into the sack and the cut-off starts to function, the sack only has to drop ¼ in., when a spring functions to quickly complete the cut-off. On the old style the sack had to drop 1⅜ in. before the flow of material was completely cut off. By this arrangement more accurate weights are anticipated than are otherwise possible.

Gravel Operations Around Columbus

In the district area of Columbus. the largest operator, the Georgia Gravel Co., recently completed negotiations with the Florida Gravel Co. whereby the latter com-

Another construction view

pany would supply the Georgia company its gravel requirements. Accordingly a suction (pump) dredge, barges and other floating equipment of the Florida Gravel Co. have been moved up the Chattahoochee river to a point a few miles below Columbus and operations begun. The gravel is very well graded although of comparatively small size. After being loaded on barges, it is brought to a newly constructed dock at Columbus. Most of this river equipment is Diesel engine driven.

In this same district the Columbus Sand Co. and the Wardlaw Sand and Gravel Co. have small operations for local trade only, being served by trucks. The former company is intending to build a small washing plant shortly.

Old dredge and pit of Atlanta Sand and Supply Co.

Byproduct Crushed Granite

In the Lithonia district the Consolidated Quarries Co. is the largest producer of crushed granite. In the same district are several dimension-stone quarries which used to ship some crushed stone as a means of disposing of the spalls, but in the past year or so they have shipped very little material. However, these operators plan to return to this market when prices are more favorable to their small operations.

Pump for hydraulicking sand at above plant

In the sand producing sections of the state, notably at Junction City, Roberta, Columbus and Gaillard, very little activity is being experienced mainly because of slackening up of road work in that section and because of unfavorable changes in freight rates during the past year and a half. The operations in the localities mentioned produce sand but no gravel. The operations are all hydraulic, using 6-in. to 8-in. centrifugal pumps mounted on pontoons, usually without a cutter, although the dredge of the Atlanta Sand and Supply Co. of Gailliard has been equipped with a J. M. Allen cutter head. At the newer operation of Brown Bros. at Roberta the sand is flumed to the dredge and broken down from the bank with a hydraulic monitor. The producers in the district all favor the pumping and hydraulic equipment of the Georgia Iron Works, Augusta.

South Georgia

At Cordele, in south Georgia, the Southern Limerock Co. during the past year has revamped its plant and expects to resume operations shortly. This plant was described in Rock Products about two years ago at the time of its construction. Since that time the plant has been rebuilt and differs from the other limerock operations in that a belt conveyor is used from the pit to the loading apron and the pulverizing equipment is in the quarry. A Williams "Jumbo" hammer mill is used for pulverizing, the mill being fed by a pan conveyor, this contrasts with the other plants which almost invariably use slugger rolls for this work.

Kaolin Developments

Considerable activity is reported in the kaolin producing sections adjacent to Macon. At Dry Branch, Moore and Munger, with head offices in New York City, are reported to have made considerable expansion and during February of this year installed a 90-in. by 60-ft. Ruggles-Coles (Hardinge Co.) indirect heat, class XB rotary dryer rated at a capacity of 8 tons per hour, from 22% moisture down.

U. S. Government Will Not Recognize Oklahoma's Cement Contract

AS NOTED on p. 78 of Rock Products, February 28, the Oklahoma state highway department recently asked for bids on 1,000,000 bbl. of cement, f.o.b mill. Only one of the 11 or 12 companies submitting bids did so on a mill-price basis. The others bid f.o.b. certain destination points, as is the customary way of quoting cement prices. The highway commission awarded a contract for 50,000 bbl. to the mill which bid the f.o.b. mill prices, and 950,000 bbl. to a mill in Oklahoma on an f.o.b. destination price. It is reported now that the United States Bureau of Public Roads has refused to recognize the award of contracts on this basis as legal, and refuses to advance federal-aid road funds.

Quarry Employe Loses Life in Shop Fire

JOHN ZUERCHER of Buffalo, Iowa, 66 years old, was burned to death March 3 when fire destroyed a machine shop at the Dolese Bros. quarries, just west of Buffalo.

The fire was discovered by an employe of the Dewey Portland Cement Co., about a mile east of Buffalo, who saw the flames. He notified his foreman and they started for the scene. They were delayed on the way, however, when a train blocked the highway.

Upon reaching the scene the building was a mass of flames, they explained, and they went immediately to the home of William Gregg, steam-shovel engineer for the Dolese firm, in Buffalo. Gregg, in turn, aroused S. C. Burtis of Buffalo, superintendent of the quarries, and they returned to the fire.—*Davenport* (Ia.) *Democrat.*

New Stone Plant for Lexington, Missouri

THE R. AND L. STONE CO. of Kansas City, Mo., has leased a quarry four miles south of Lexington and will mine 20,000 cu. yd. of rock for the government for use on the river work here.

Preliminary work for opening of the quarry is now under way. Mining operations will begin soon, it is planned, and when in full swing will employ approximately 110 men.—*Lexington* (Mo.) *Advertiser.*

Management of Heat and Power In Cement Plants*

The Author Establishes Guiding Principles and Diagrams to Be Used in the Examination and Evaluation of Cement Kilns and Cement-Burning Processes

ENGINEER KOCH investigates and illustrates the operating conditions of cement kilns by the use of diagrams. He confines his investigations to two specific cases, namely a wet-process kiln, and a dry-process kiln. His calculations are based upon a total water content of 7.5% in the raw flour for the dry-process kiln, and of 40% in the slurry for the wet-process kiln.

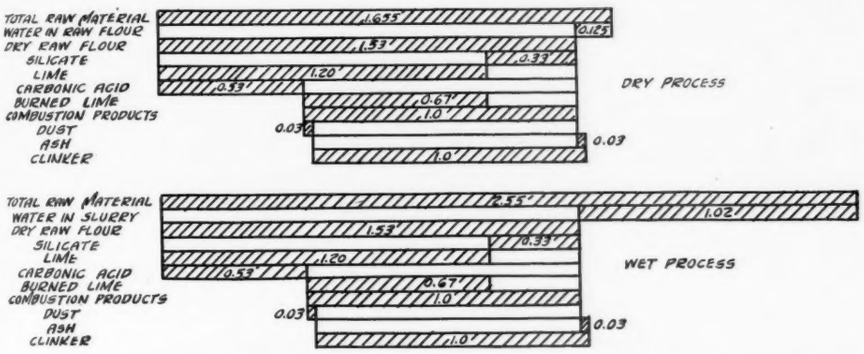


Fig. 1. Composition of the raw material and of the clinker, also chemical rearrangement for both dry and wet process

It is assumed that the dry raw material contains 78.5% $CaCO_3$, and that the amount of dust lost equals the accumulation of ashes from the fuel. Slight deviations from these assumed figures and particularly also slight admixtures of $MgCO_3$ do not influence the result of the investigations to any considerable extent.

The composition of the raw material and of the clinker, and also the chemical rearrangement, are illustrated in Fig. 1, for both the dry process and the wet process, based on one kg. of clinker. A fuel consumption of 25% and a calorific value of 7000 kcal. per kg. of coal is assumed for the dry process, and a fuel consumption of 33% and a calorific value of 6500 kcal. per kg. of coal is assumed for the wet process. The heat requirement is based on the equation of dissociation of the carbonate of lime: 1.79 kg. $CaCO_3$ = 1.0 kg. CaO + 0.79 kg. CO_2 — 760 kcal. for the 1.2 kg. $CaCO_3$, which is required for 1 kg. of clinker according to Fig. 1, is found to be $760 \cdot 1.2 \div 1.79 = 510$ kcal. per kg.

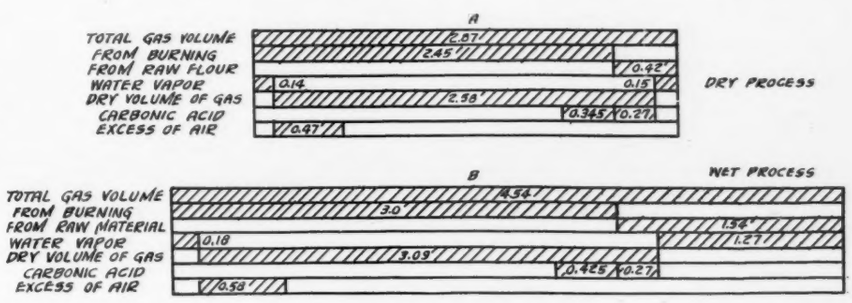
After the heat flow in the kiln has been analyzed in detail, it is found that in the dry process 1770 kcal. of heat is supplied per kg. The radiation losses in the burning section and in the cooling section are placed at 150 + 30, or 180 kcal. per kg. of clinker; the waste heat losses in the clinker amount to 40 kcal. per kg.; and the determinable heat in the stack gases or waste-gases amounts to 1020 kcal. per kg.; making a total loss of 1240 kcal. per kg. Therefore 540 kcal. per kg. is used by the kiln itself, of which 75 kcal. per kg. is latent heat of evaporation and 455 kcal. per kg. is actually used for burning the dry raw flour. A total of 510 kcal. per kg. is used for dissociation and 45 kcal. per kg. is used due to the difference in the specific heat of the raw flour and the product of the burn, making 555 kcal. per kg. Then, 100 kcal. per kg. is reclaimed through the exothermic heat of formation of the clinker, which leaves an actual consumption of 455 kcal. per kg. of clinker.

Similarly, it is found that in the wet process 2185 kcal. per kg. is supplied to the kiln. The radiation losses in the burning section and the cooling section amount to 150 plus 30, which is 180 kcal. per kg.; the waste heat in the clinker amounts to 40 kcal. per kg., while the determinable heat in the waste gases is 900 kcal., making a total loss of 1120 kcal. per kg. The kiln uses 1065 kcal. per kg., of which 610 kcal. per kg. is latent heat of evaporation, which leaves a heat consumption of 455 kcal. per kg. of clinker for burning the dry raw flour.

When burning a coal of 7000 kcal. per kg. in the dry process, the theoretical volume of the flue gases amounts to 7.9 cu. nm. per kg. of coal, and the theoretical air requirement is 7.55 cu. nm. per kg. of coal. When the excess of air is 25%, the stack gas volume amounts to 9.79 cu. nm. per kg. of coal.

Again, when using a coal of 6500 kcal. per kg. for the wet process, and when burning without excess of air, 7.35 cu. nm. per kg. of coal is obtained in burning, and the theoretical volume of combustion air is about 7.05 cu. nm. per kg. of coal. When burning with 25% excess of air, the waste gas volume is 9.1 cu. nm. per kg. of coal. Figs. 3a and 3b show the distribution of the waste heat in the dry and wet processes. At the same excess of air, the CO_2 content becomes smaller, as the heat consumption increases; and it is lower in the wet process.

The determinable heat content of the waste gases is 356 kcal. per cu. nm. in the dry process, and 198 kcal. per cu. nm. in the wet process; while the temperature of the waste gases at the kiln end is 945 deg. C. in the dry process and 540 deg. C. in the wet process. Fig. 4 shows the heat content of the waste gases at the various temperatures for both burning processes.



Figs. 3a and 3b. Volume and composition of waste gases in cu. nm. per kg. in the dry and wet process

*Abstracted from a series of articles by the graduate and chief engineer, Jakob Koch, which appeared in *Zement* (1930) 19, Nos. 14, 15, 16, 18.

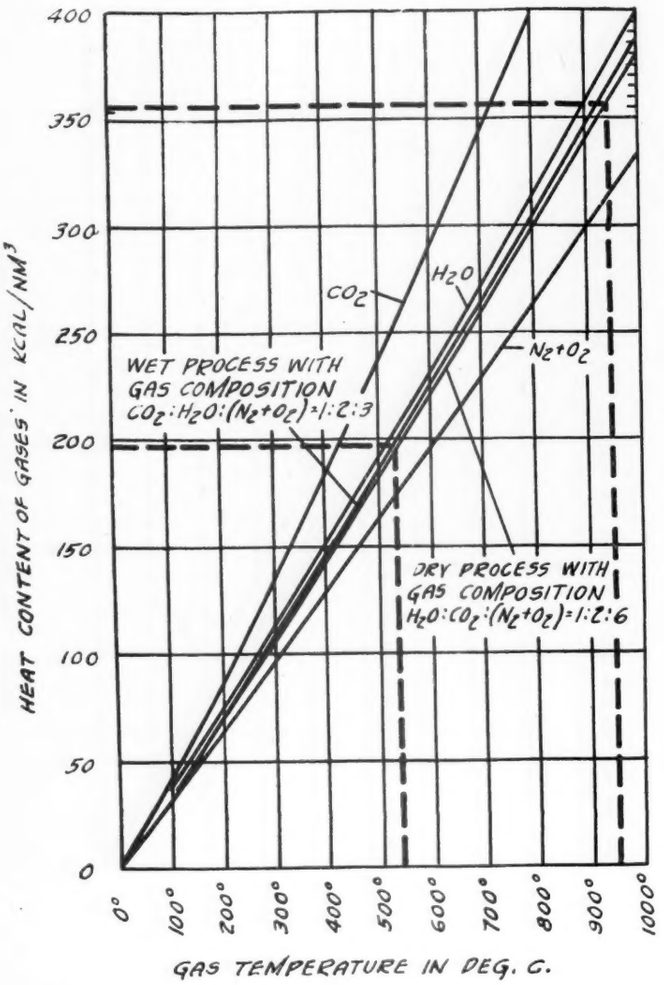


Fig. 4. Shows heat content of waste gases at various temperatures

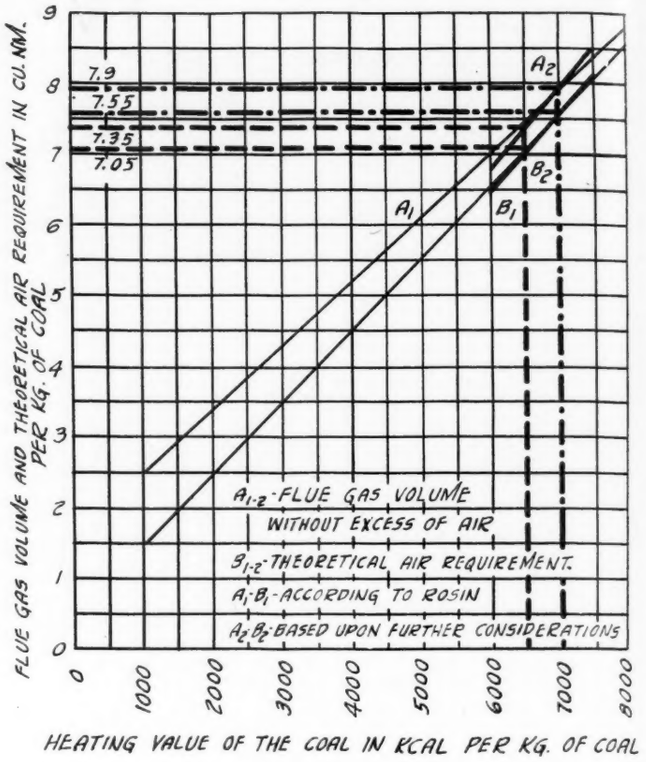


Fig. 5. Presentation of flue gas volume

The illustrations presented so far are suited only for presenting certain operating conditions, as for example, an illustrated summary of test results. But they do not show how the operating conditions change when one of the many operating conditions is varied, as for example, fuel consumption, heating value of the fuel, excess of air, water content of the slurry, composition of the raw material, heat losses, etc. As an instance, it is usually of interest to know readily how the volume and temperature of the waste gas change, especially since these changes again give inferences as to the changes in operating conditions as for example the temperature in the kiln. Such determinations are of special importance to cement plants in which the waste heat is utilized.

It is comparatively easy to make a general presentation of the volume of the flue gases, because with all kinds of fuels, the theoretical flue gas volume and the volume of CO_2 formed per kg. of fuel are nearly proportional to the lower calorific value of the fuel. (See Fig. 5.) The fluctuations in water vapor are of only slight consequence as a whole. This proportionality of figures can be extended to other calculations.

In Fig. 6 is shown the volume of flue gas obtained in the burn per kg. of clinker, dependent upon the heat supply per kg. of clinker, and this again is dependent upon the fuel consumption and the calorific value of the fuel. By entering upon this diagram lines for the same excess of air, the entire volume of flue gases from the burn can be obtained also when burning with excess of air. In order to determine, however, the total gas volume, the carbonic acid and water vapor obtained from the raw material must be considered, being 0.42 cu. nm. per kg. clinker in the dry process and 1.54 in the wet process. For this purpose, the two lower scales in Fig. 6 have been placed so that the total waste gas volume can be read, besides the waste gas volume of the burn alone.

The diagram Fig. 7 gives the CO_2 content from the raw material. It contains also the lines of similar CO_2 content for burning without formation of CO. For determining from this diagram the entire volume of flue gas, only the volume of water vapor from the raw material need still be considered, which is 0.15 cu. nm. per kg. in the dry process, and 1.27 in the wet process. The total gas volume including the water vapor, can be read on the base scale. This diagram shows how the CO_2 content varies when the fuel supply, calorific value of the fuel, or the excess of air varies; and again, the waste gas volume can be figured with this diagram from the heat consumption and the CO_2 content.

Fig. 8 shows the amount of water vapor

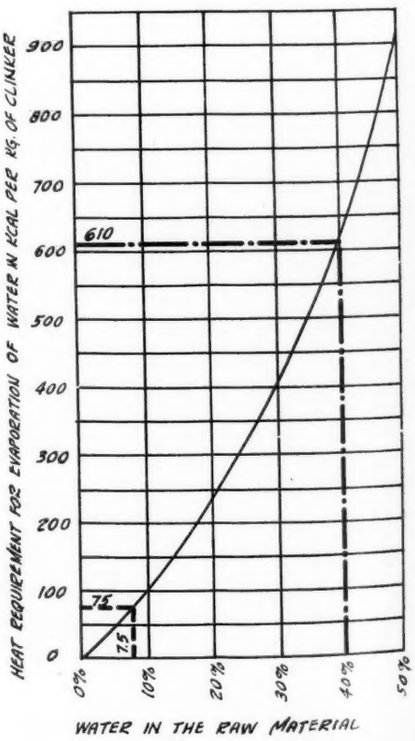


Fig. 8. Amount of water vapor dependent upon the water content of the raw material

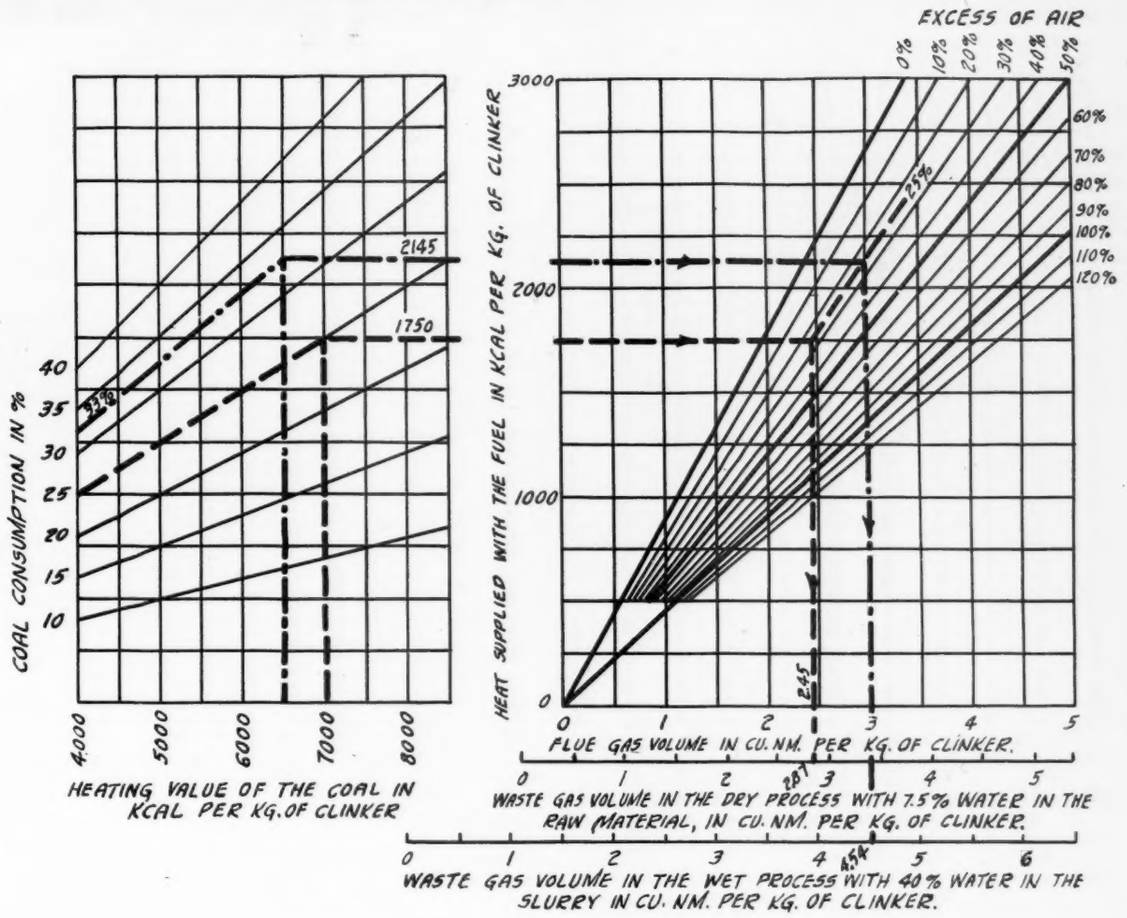

EXCESS OF AIR
0% 10% 20% 30% 40% 50%
60%
70%
80%
90%
100%
110%
120%
2145
1750
COAL CONSUMPTION IN %
HEAT SUPPLIED WITH THE FUEL IN KCAL PER KG. OF CLINKER
HEATING VALUE OF THE COAL IN KCAL PER KG. OF CLINKER
FLUE GAS VOLUME IN CU. NM. PER KG. OF CLINKER.
WASTE GAS VOLUME IN THE DRY PROCESS WITH 7.5% WATER IN THE RAW MATERIAL, IN CU. NM. PER KG. OF CLINKER.
WASTE GAS VOLUME IN THE WET PROCESS WITH 40% WATER IN THE SLURRY IN CU. NM. PER KG. OF CLINKER.

Fig. 6. Flue gas volume per kg. of clinker at different coal consumptions, heating values and excess of air

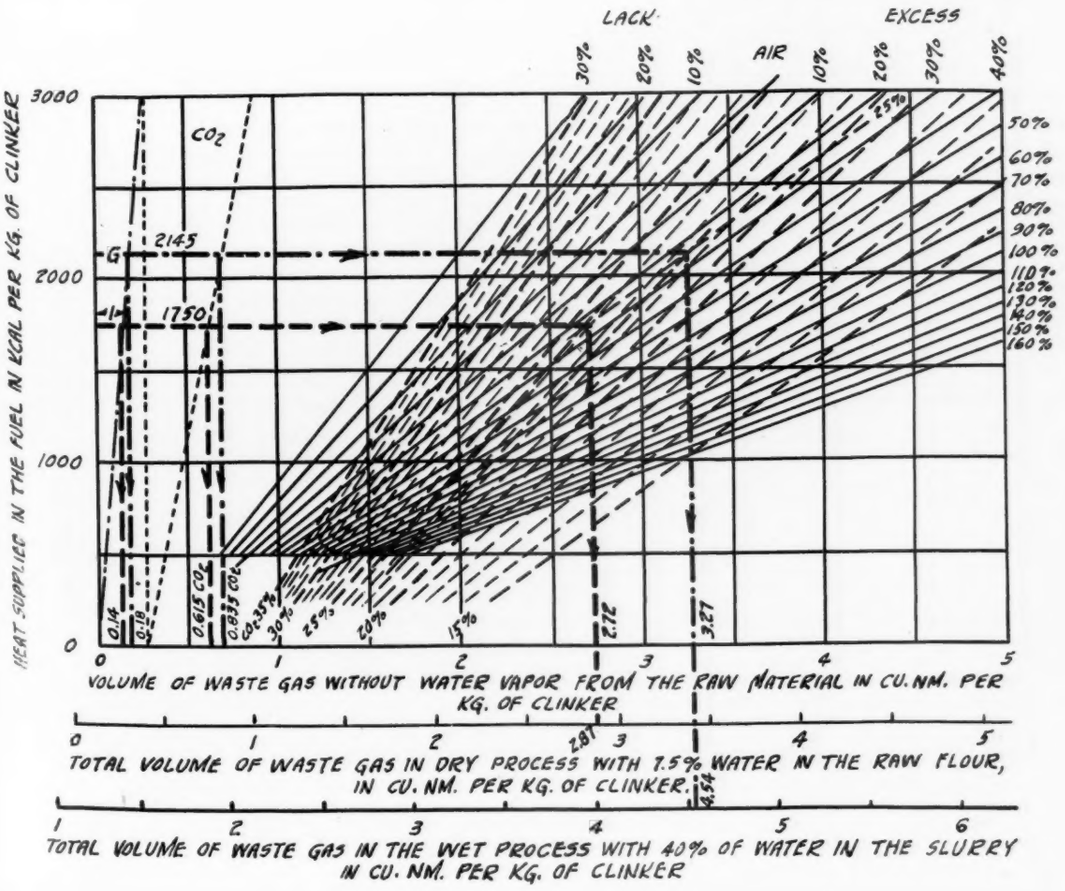
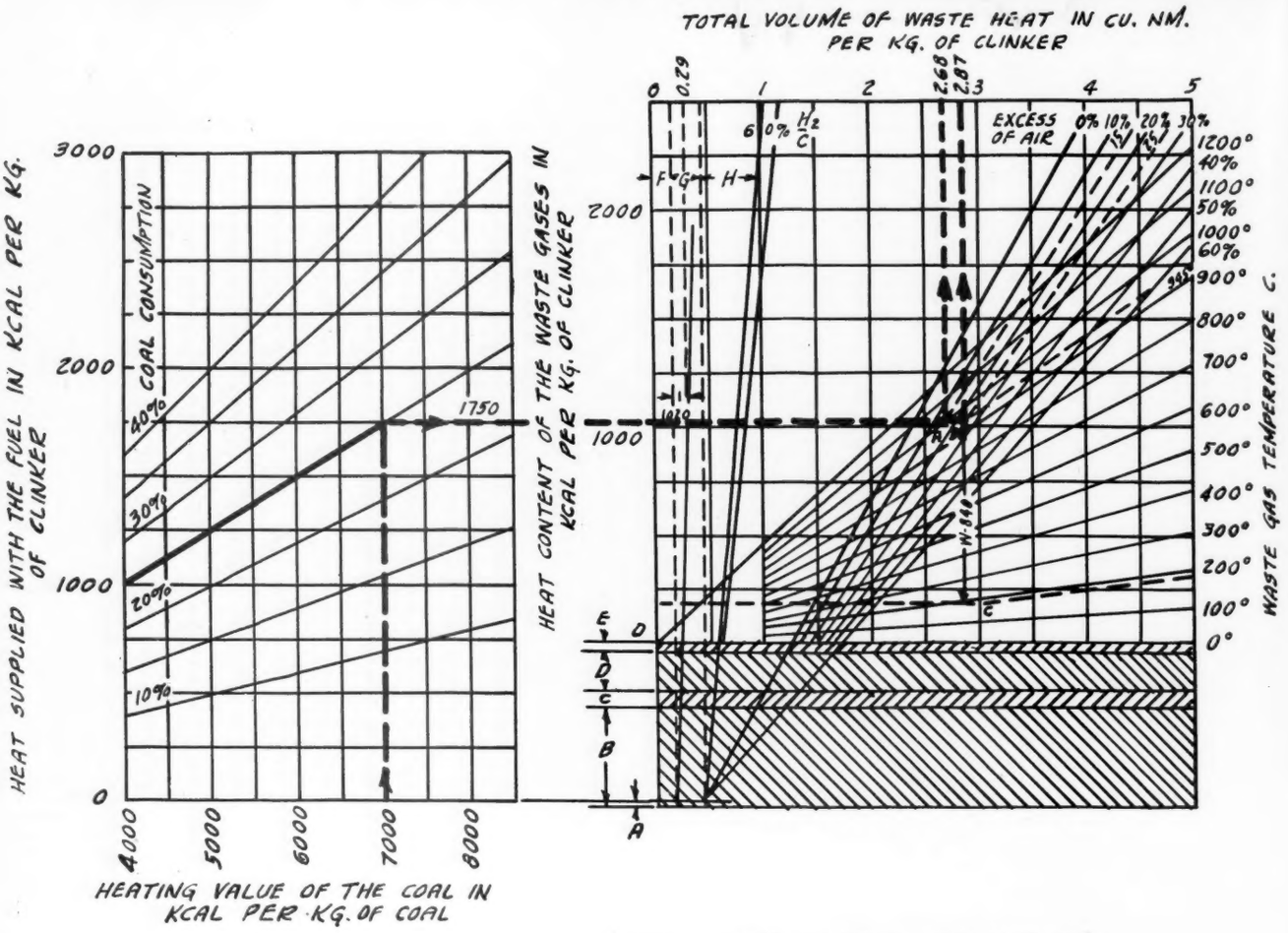

LACK AIR EXCESS
30% 20% 10% 10% 20% 30% 40%
50%
60%
70%
80%
90%
100%
110%
120%
130%
140%
150%
160%
CO_2
2145
1750
HEAT SUPPLIED IN THE FUEL IN KCAL PER KG. OF CLINKER
VOLUME OF WASTE GAS WITHOUT WATER VAPOR FROM THE RAW MATERIAL IN CU. NM. PER KG. OF CLINKER
TOTAL VOLUME OF WASTE GAS IN DRY PROCESS WITH 7.5% WATER IN THE RAW FLOUR, IN CU. NM. PER KG. OF CLINKER.
TOTAL VOLUME OF WASTE GAS IN THE WET PROCESS WITH 40% OF WATER IN THE SLURRY IN CU. NM. PER KG. OF CLINKER

Fig. 7. Relation between heat supply from the fuel, excess and shortage of air and CO_2 content of waste gases


TOTAL VOLUME OF WASTE HEAT IN CU. NM. PER KG. OF CLINKER
HEAT SUPPLIED WITH THE FUEL IN KCAL PER KG. OF CLINKER
COAL CONSUMPTION
HEAT CONTENT OF THE WASTE GASES IN KCAL PER KG. OF CLINKER
WASTE GAS TEMPERATURE C.
EXCESS OF AIR
HEATING VALUE OF THE COAL IN KCAL PER KG. OF COAL
1750

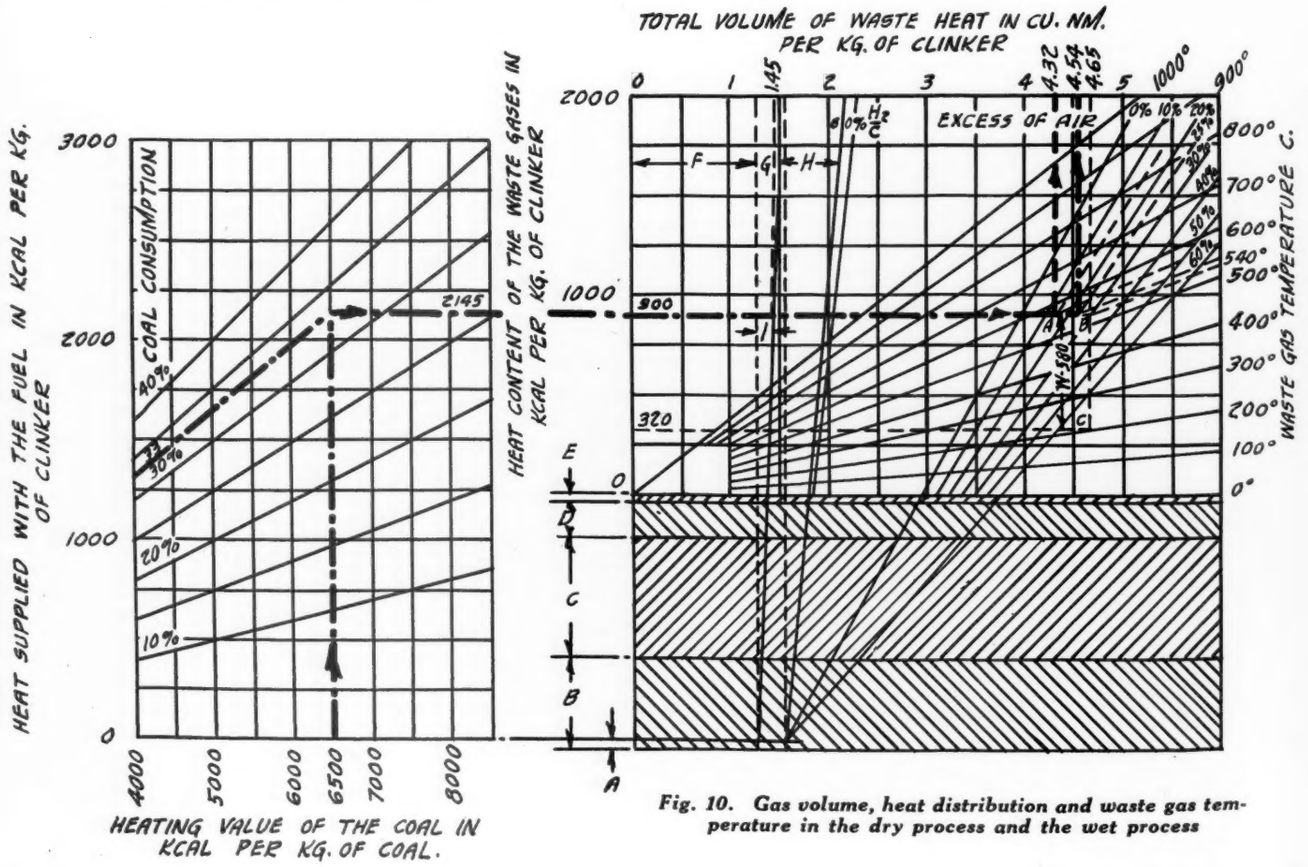

TOTAL VOLUME OF WASTE HEAT IN CU. NM. PER KG. OF CLINKER
HEAT SUPPLIED WITH THE FUEL IN KCAL PER KG. OF CLINKER
COAL CONSUMPTION
HEAT CONTENT OF THE WASTE GASES IN KCAL PER KG. OF CLINKER
WASTE GAS TEMPERATURE C.
EXCESS OF AIR
HEATING VALUE OF THE COAL IN KCAL PER KG. OF COAL.
2145

Fig. 10. Gas volume, heat distribution and waste gas temperature in the dry process and the wet process

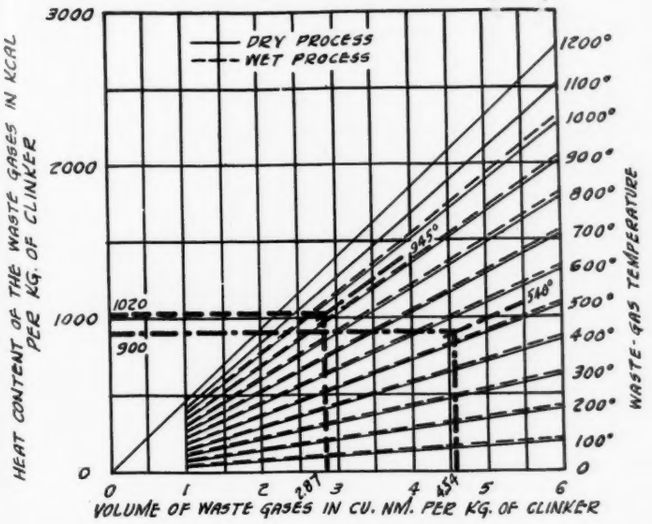


Fig. 9. Relation between volume of waste gas, heat content of waste gas and waste gas temperature

dependent upon the water content of the raw materials.

Fig. 9 shows the heat content of the waste gases in kcal. per kg. of clinker at different waste-gas temperatures dependent upon the waste-gas volume in cu. nm. per kg., corresponding to the values in Fig. 4 for the dry and the wet processes. After the waste-gas volume and the heat content of the waste gases have been determined, the waste-gas temperature may be read reversely from this diagram.

The waste-gas volumes and temperatures may be read for different heat supplies simultaneously with the fuel by using diagram Fig. 10 for the dry and wet processes. The heat consumption for burning of the dry raw material is figured to be 455 kcal. per kg. of clinker and the radiation losses 180, and the clinker temperature at the discharge 200 deg. C. These diagrams show how the gas volume, gas temperature and heat content of the waste gases vary when the heat supply is varied with the fuel or with an excess of air. If the heat consumption or heat loss of a kiln is varied, only the temperature lines need be shifted, in a parallel direction.

Diagram Fig. 11 shows the heat required for evaporating water dependent on the water content of the raw materials, the latent heat of evaporation only being considered, which is 595 to 600 kcal. per kg. of water. The rapid increase in heat requirement with the increase in water content, shows at once why the heat content of the

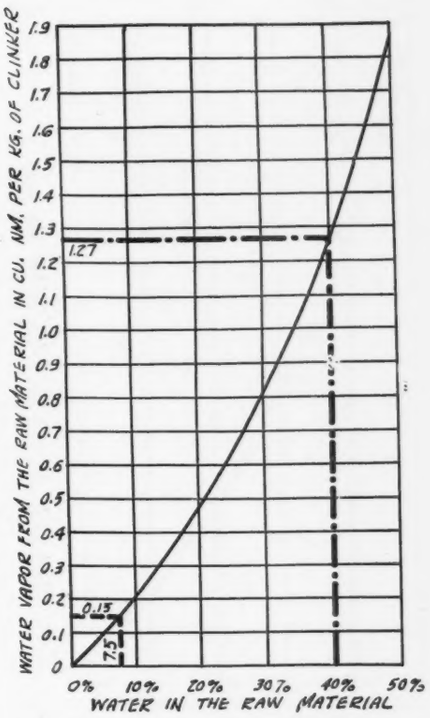


Fig. 11. Heat required for evaporating water (liquid heat and latent heat of evaporation, decreased by the determinable heat of the water vapor) dependent upon water content of raw material

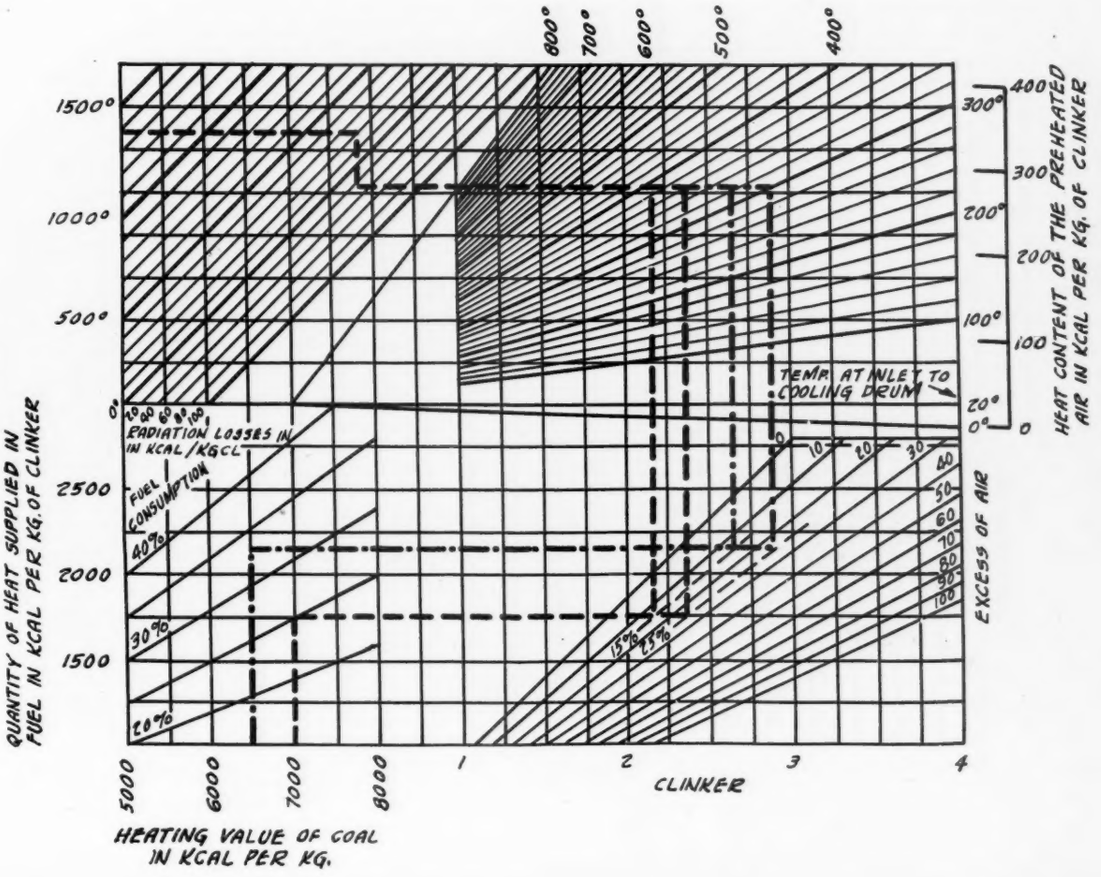

QUANTITY OF HEAT SUPPLIED IN FUEL IN KCAL PER KG. OF CLINKER
HEATING VALUE OF COAL IN KCAL PER KG.
RADIATION LOSSES IN KCAL/KGCL
FUEL CONSUMPTION
40%
30%
20%
CLINKER
TEMP. AT INLET TO COOLING DRUM
EXCESS OF AIR
HEAT CONTENT OF THE PREHEATED AIR IN KCAL PER KG. OF CLINKER

Fig. 12. Relation between heating value of the coal, coal consumption, excess of air, combustion air volume, cooling of the clinker and preheating of the burning or combustion air

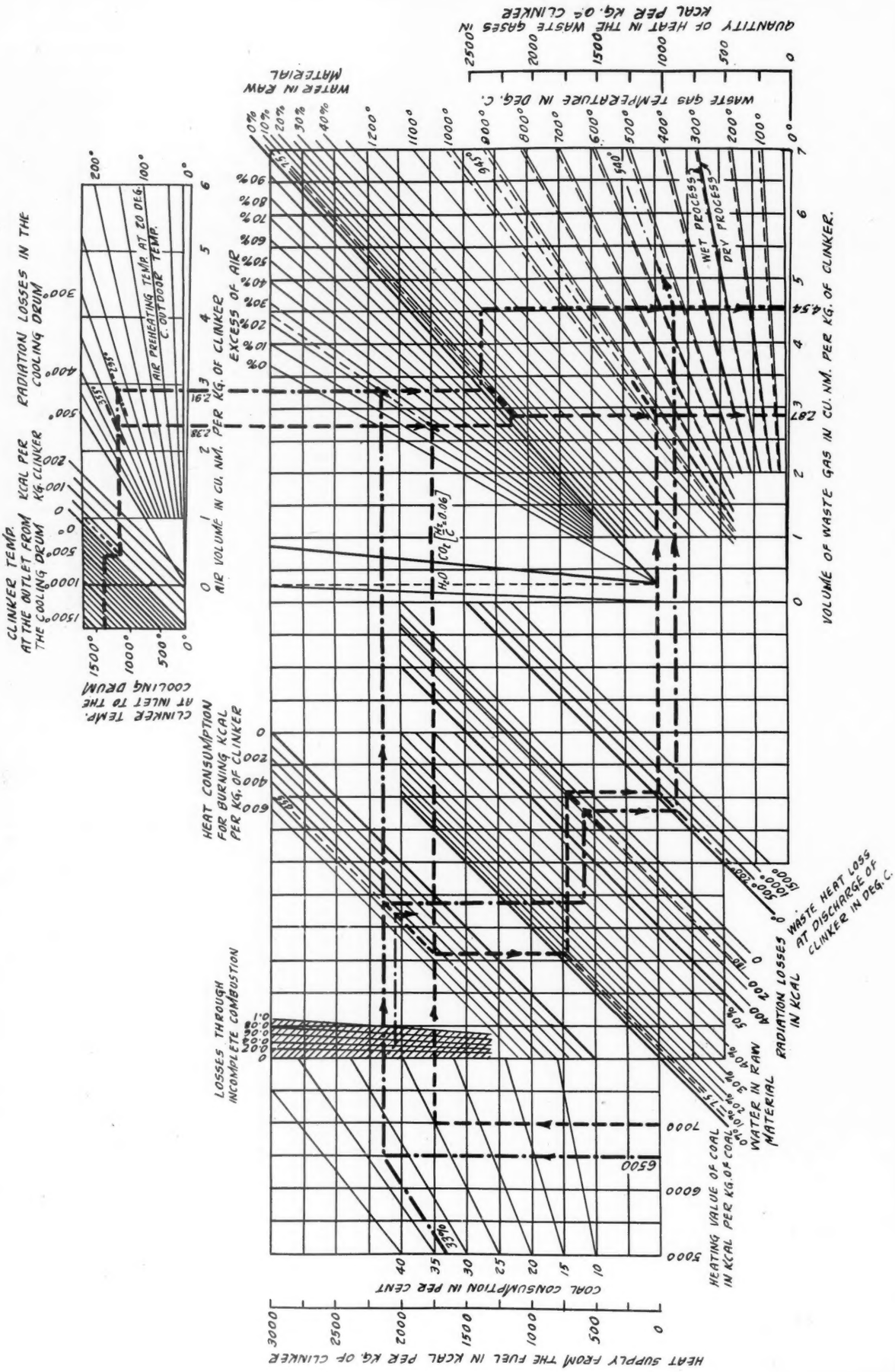

HEAT SUPPLY FROM THE FUEL IN KCAL PER KG. OF CLINKER
COAL CONSUMPTION IN PER CENT
HEATING VALUE OF COAL IN KCAL PER KG. OF COAL
WATER IN RAW MATERIAL
RADIATION LOSSES IN KCAL
WASTE HEAT LOSS AT DISCHARGE OF CLINKER IN DEG. C.
LOSSES THROUGH INCOMPLETE COMBUSTION
HEAT CONSUMPTION FOR BURNING KCAL PER KG. OF CLINKER
CLINKER TEMP. AT INLET TO THE COOLING DRUM
CLINKER TEMP. AT THE OUTLET FROM THE COOLING DRUM
KCAL PER KG. CLINKER
RADIATION LOSSES IN THE COOLING DRUM
AIR PREHEATING TEMP. AT 20 DEG. C. OUTDOOR TEMP.
AIR VOLUME IN CU. NM. PER KG. OF CLINKER
EXCESS OF AIR
VOLUME OF WASTE GAS IN CU. NM. PER KG. OF CLINKER.
WET PROCESS
DRY PROCESS
WASTE GAS TEMPERATURE IN DEG. C.
QUANTITY OF HEAT IN THE WASTE GASES IN KCAL PER KG. OF CLINKER
WATER IN RAW MATERIAL

Fig. 13. Relation between heating value of the coal, coal consumption, excess of air, volume of waste gas, heat consumption of the kiln, preheating and waste gas temperature at complete and incomplete burning and at various heat requirements for burning and at various losses in the kiln

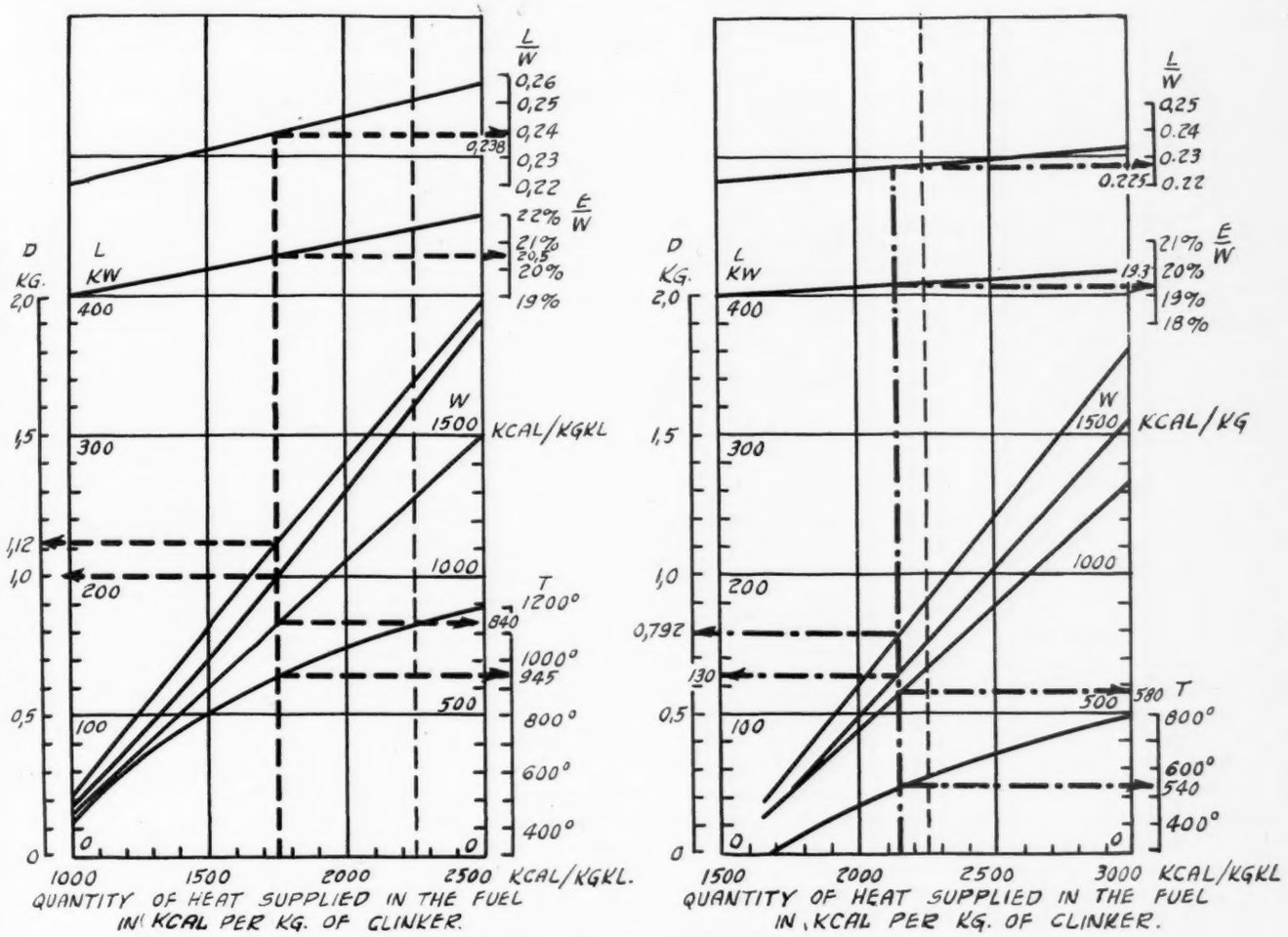


Fig. 15. Relation between heat supply, waste gas temperature, heat content of waste gases, steam generation and attainment of output. W is heat given off by the waste gases in the kiln head and waste heat plant, the utilized quantity of heat when cooling to 180 deg. C. in the dry process or to 200 deg. C. in the wet process; T is temperature of waste gases at the inlet at the waste heat plant; D is steam generation in kg. steam per kg. of clinker, or, in tons of steam per tons of clinker; L is the electric output in kw. per ton hour of clinker production; E is 0.86 L, the heat equivalent of the produced output in kcal. per kg. of clinker

waste gases is so much lower in the wet process than in the dry process, in spite of the greater supply of heat from the fuel.

From the diagram Fig. 12 can be determined the heat content of the preheated combustion air and the preheating temperature for any clinker temperature at the inlet to the cooling drum or cooling zone, for any desirable clinker temperature at the discharge of the cooling drum and also for any radiation losses in it. It is understood that all combustion air is passed through the cooling drum. If this is not the case, the temperature obtained corresponds to the mixing temperature of the combustion air preheated in the cooling drum and that supplied direct without preheating.

In order to meet all possibilities of variations, the diagram Fig. 13 has been prepared. From this diagram may be read for any calorific value of the fuel, for any consumption of coal and air excess, the volume of waste gas; and at the same time for a heat consumption for burning the dry raw flour, for a water content of the raw material and for a loss in radiation and

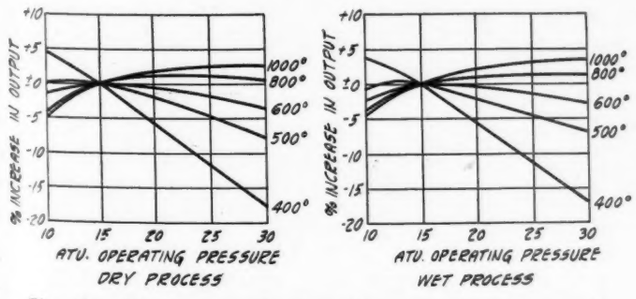


Fig. 16. Maximum production of energy at various waste heat gas temperatures and operating pressures. Left. 95% vacuum; right, 92% vacuum, dry and wet process

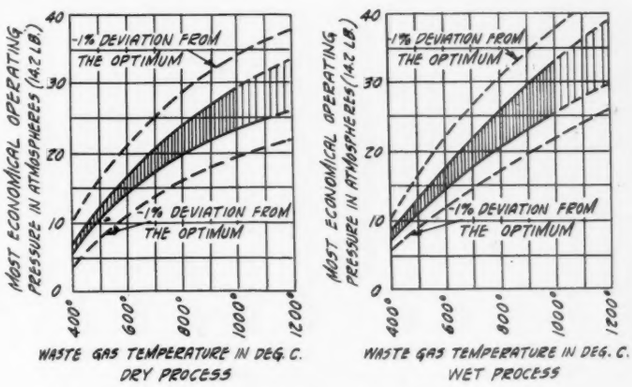


Fig. 17. At 95% and 92% vacuum, dry and wet process. The most economical operating pressure depending on waste gas temperature

waste heat in the clinker, also the volume of heat in the waste gases and with it the waste-gas temperature and also the preheating temperature of the combustion air. The CO_2 content of the waste gases has not been entered since the lines for similar CO_2 content run nearly equal with the lines for the same air excess. Diagram Fig. 13 shows furthermore the losses due to incomplete burning of the fuel at various values of CO/CO_2; and from it can be determined also the radiation losses of the rotary kiln if the temperature and volume of the waste gas is known, considering, however, the losses due to incomplete burn under formation of CO.

The determination of the volumes and temperatures of waste gases and with it of the determinable heat content is especially important for kiln plants which operate with a utilization of the waste heat for drying purposes or for generating steam for operating prime movers. The heat available and the heat losses under different operating conditions of a waste-heat plant for the dry process and also one for the wet process are discussed briefly. Fig. 15 shows how under otherwise similar conditions the temperature of the waste gases, the quantity of heat given off in the kiln head and the waste-heat plant, the production of steam, the attainable output and the relation of the utilized energy or the output attained varies in relation to the quantity of heat delivered, when the heat supplied in the fuel is varied. Fig. 16 shows the maximum of energy obtainable at various waste-gas temperatures and operating pressures, and Fig. 17 the most economical operating pressure in dependence upon the waste-gas temperature.

Conversion Table

1 kcal. is 4 B.t.u.
1 kcal. per kg. is 1.8 B.t.u. per lb.
1 cu. nm. is 1 cubic meter based upon 0 deg. C. per 760 mm. pressure.
1 atu. (atmosphere) is 14.2 lb. pressure gage per sq. in.

North African Phosphate

THE SHORTAGE of hand labor in North African phosphate mines caused by agricultural needs is not so serious as two years ago and the agricultural situation in Europe has somewhat slackened the demand for phosphate. Stocks which had reached a very low level a year ago have increased.

Production in Algeria during the first nine months of 1930 was 647,816 metric tons as compared with 654,410 in the corresponding months of 1929. October production fell sharply on account of the closing of the M'Zaita mines.

Production in Tunisia during the first eight months of 1930 reached 2,123,000 tons. Exports during the same period were 1,925,000 tons. The increase in stocks is said to consist chiefly of low-grade phosphates.—U. S. Consul O. S. Heizer, Algiers.

Los Angeles Chamber of Commerce to Assist Nonmetallic Industry

THE LOS ANGELES, Calif., Chamber of Commerce has recently formed a special committee to boost the nonmetallic industries of the county. It may be taken as proven that this is something more than the usual gesture of good will toward an industry, for everyone admits that when the Los Angeles Chamber of Commerce boosts anything it is boosted. In fact, there are envious cities in other parts of the United States which ascribe all the growth and prosperity of the city to its boosting proclivities.

One wonders why it wasn't done before, but chambers of commerce have been slow to recognize the existence of the rock products industry. When the writer of these lines was going up and down the land, seeking what was new in the industry, he rarely obtained any information from chambers of commerce. In fact, they sometimes knew even less about the local industry than the writer knew. So it is to be hoped that the example of the Los Angeles body will be followed by other chambers of commerce throughout the country.

The industry in Los Angeles county is certainly big enough to merit some attention, as it means more in capital invested and value of product than many an industry which gets into the newspaper headlines much oftener. The total mineral production of California in 1929 amounted to $432,248,228, metals, petroleum, chemicals and rock products, and Los Angeles county produced more than half of this or $243,568,275. Production in the territory adjacent to the county is also large, southern California being credited with about 90% of the state's total mineral production.

Of course the greater part of this value is petroleum, but the value of some other nonmetallic products run into substantial figures, as the following (from the just released 1929 state report of mineral production) will prove:

Mineral	Quantity	Value
Barytes	26,798 tons	$188,829
Bituminous rock	3,320 tons	14,360
Borates	144,678 tons	3,312,085
Brick and tile		5 607,410
Portland cement	12,794,729 bbl.	21,038,565
Pottery clay	839,949 tons	1,127,517
Dolomite	58,644 tons	158,928
Feldspar	13,377 tons	78,404
Granite		1,169,271
Fuller's earth	15 541 tons	170,563
Gypsum	140,844 tons	396,951
Burned lime	42,834 tons	417,101
Limestone	162,315 tons	537,817
Marble onyx and travertine		93,661
Mineral paint	477 tons	2,820
Pumice and volcanic ash	10,449 tons	76,123
Sandstone	177,655 tons	49,881
Silica	18,686 tons	79,210
Soapstone and talc	18,676 tons	193,493
Miscellaneous stone		17,840,159

The last item includes macadam, ballast, rip-rap, sand and gravel, and is mainly sand and gravel. There is also another "unapportioned" item of $5,329,373, which includes such rock products as asbestos, diatomaceous earth, sericite mica, slate and the sillimanite-andalusite-cyanite group.

In addition to developing enlarged markets for minerals now produced, the Chamber of Commerce, through this committee, will try to develop markets for other minerals. It is studying standards and specifications for mineral products. The committee is divided into six subcommittees, one for each of the following groups:

1. Barytes, gypsum, lepidolite, talc, mineral paint and titanium minerals.
2. Fire clay, china clay, fuller's earth, bentonite and sillimanite.
3. Feldspar, silica, fluorspar and silica sand.
4. Salt, soda and epsomite.
5. Granite, marble, garnet and pumice.
6. Dolomite, limestone, magnesite, graphite and mica.

The committee is made up of both producers and users of nonmetallic products, the chairman being E. O. Slater, manager of the Smith Emery Co. There are three producer members, three representatives of commercial testing laboratories, and three representatives of the industrial departments of the Santa Fe, the Southern Pacific and the Union Pacific railroads. The Producer members are Frank R. Wicks, of the Pacific Coast Talc Co., A. S. Flynt, of the Flynt Silica and Spar Co., and J. Benell, of the Crystal Silica Co.

Among its immediate concerns, the committee is working in connection with the State Department of Mines to secure space in the new state building which is to be erected here for an exhibit of nonmetallic minerals and a room in which they may be examined. It is not an easy matter to secure this, as the space planned had been practically all allocated before requisition for exhibit space was made.

Explosion Wrecks Office

A DYNAMITE EXPLOSION early February 28 wrecked the frame office building of the M. C. Grove Lime Co., near Stephens City, Va. The building was also burned. Company officials were uncertain whether the explosion caused the fire or whether it followed ignition of the structure from another cause undetermined.

Methods of Measuring Water for Cement Briquet Tests

TWO METHODS for the measurement of quantities of water used in mixing cement mortar for standard briquet tests are described in *Public Roads*, November, 1930.

At the laboratory of the Missouri State Highway Department an adaptation of the automatic burette (with inlet, outlet and overflow) is used, as indicated in Fig. 1. The intake is connected through a turncock to a large bottle of distilled water, the outlet connected to a rubber hose and pinchcock leading down to the work table, and the overflow connected to a sump and overflow bottle. The burette tube has a volume of 100 c.c. from the upper graduation on the neck to the overflow, and the neck has a volume of 10 c.c. with 0.5 c.c. graduations. Thus any quantity of water from 100 to 110 c.c. may be accurately measured to 0.25 c.c. (about one-fourth of 1%). In operation, the intake cock is opened until the burette overflows and is then shut off and the pinchcock opened until the desired amount of water as indicated by the graduations has flowed into the cement-sand mixture. Then the intake cock is again opened, so that the burette refills while the batch is being mixed, and the operation is repeated.

In the laboratory of the Bureau of Public Roads an adaptation of the constant-level water bottle is used, as shown in Fig. 2. In this method a special burette is connected by rubber tubing with a 5-gal. water bottle and arranged so that it may be slid up or down on its supporting holder. The bottle is closed with a rubber stopper through which is a piece of ¼-in. glass tubing. This tubing and the burette are arranged so that the bottom of the tubing is in the same horizontal plane with the zero mark at the top of the burette.

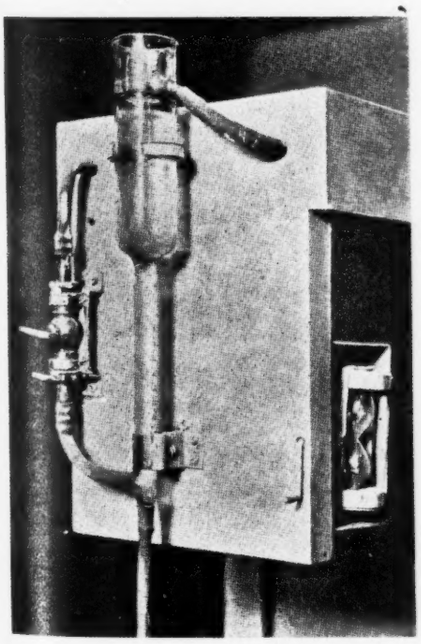


Fig. 1. Burette for accurate measurement of water

In operation, the two-way stopcock on the burette is opened to permit water to flow into it, which fills it to the level of the bottom of the glass tubing on the zero mark of the burette. The stopcock is then turned to let the desired amount of water drain out to the cement mixture, and again turned back to the filling position which causes the water to again rise to the zero mark. In this way the burette is automatically refilled each time without any further attention from the operator. The only thing which must be guarded against is leakage of air around the stopper of the supply bottle, as this causes the water level to rise in the glass tube and permits excess water to enter the burette. If this happens a preliminary filling and draining of the burette will restore the proper balance.

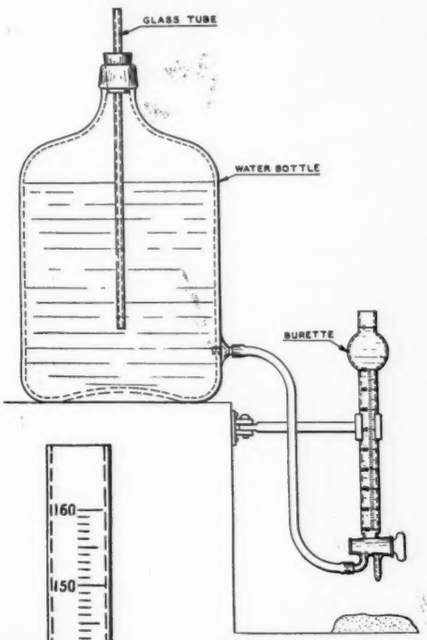


Fig. 2. Semi-automatic apparatus for measuring water

When the same amount of water is required for each batch, a modification of the above apparatus permits an entirely automatic measurement of the water. In this case the burette has inverted readings as shown in Fig. 3, with the zero mark at the stopcock, and is adjusted in relation to the glass tube so that the desired amount of water will enter the burette. Then it is only necessary to turn the stopcock from one position to the other alternately.

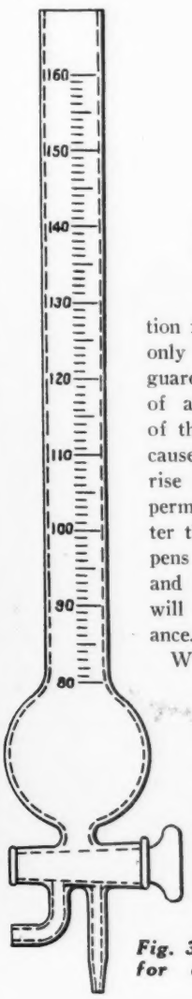


Fig. 3. Suggested burette for automatic measurement

Progress on New Big Michigan Quarry Development

THE FIRST STEP in construction of a dock for the Thunder Bay Quarries Co., which located near Alpena, Mich., in December, 1930, and is preparing to develop extensive stone holdings to the north of Alpena, was taken the last week in February.

Tons of dirt are being hauled by a fleet of trucks for the fill-in on the shore of Thunder Bay off Ford avenue, preparatory to the opening of construction on the huge pier. The fill-in material is being obtained from the excavation under the tracks of the B. C. G. & A. railway and the D. & M. tracks to the west and north of North Second avenue.

Construction of the right-of-way for the quarry company's tracks, started two months ago, is going ahead rapidly. The tracks will cross Ford avenue by means of a grade elevation. A tunnel is being made under the intersecting D. & M. and B. C. G. & A. tracks west of North Second avenue.

Approximately 100 men are now employed by the company, which is planning to start production by August 1, 1931.—*Alpena* (Mich.) *News.*

Arizona Legislature Would Have Convict-Made Cement

REPRESENTATIVES in the Arizona state legislature, Harry J. Valentine, Thomas Malony, and J. H. Lines, would authorize the state to engage in manufacture and sale of cement. a move suggested by Governor George W. P. Hunt in his message at the opening of the legislature, by establishment of a cement plant in connection with the state prison, for use of prison labor.

The cement bill would place operation of the plant under control of the board of directors of state institutions, empower the board to call upon the University of Arizona and state teachers colleges for technical assistance, to acquire deposits of material by exercising the right of eminent domain when necessary, to locate mining claims and hold them until such time as congress may grant them to Arizona, to close the plant when deemed proper to buy cement in the open market in carrying on of the state's contract cement business, and restrict the sale of cement for public use after the state plant is in operation. The measure also would place a tax on cement, and provide for its collection.—*Phoenix* (Ariz.) *Gazette.*

Pump house and pump in right foreground, and wash water being flumed back at left

Study of a Group of Crushing Plants in the Central West

Part VI—Quarry Pumping

By Earl C. Harsh
Associate Editor, Rock Products

AS STATED in previous articles of this series, some plants engaged in the production of commercial crushed stone were studied in preparing these articles, the object being to describe and discuss constructively the various phases of their operations.

Quarry pumping, which is done at practically all of these plants, is of two kinds: that required to drain the quarry so that the work may be carried on; and that to furnish water for washing the crushed stone. In a few instances the two are combined in one operation, where the water from the quarry is used for washing and then run into a ditch or creek, but generally they are entirely separate, with separate equipment for each purpose, the wash water being run back into the quarry and used over again after settling. In both cases, however, centrifugal pumps with direct-connected electric motors are used at practically all the plants.

For quarry drainage the amount of water which must be pumped out varies considerably at the different plants and of course with the season, and units are used ranging from 1000 gal. per min. capacity at 60-ft. head with a 25-hp. motor up to 2200 gal. per min. capacity at 65-ft. head with a 50-hp. motor.

Water for Washing Stone

To supply water for washing the crushed stone, similar units are used, ranging in size from 1000 gal. per min. capacity at 120-ft. head with a 40-hp. motor, up to two 1000 gal. per min. units at 190-ft. head with 75-hp. motors. At most plants, however, a single unit of 1000 gal. per min. capacity furnishes sufficient water. The average ratio of pump capacity in gal. per min. to tons output per hour is about 6⅔ to 1, or in other words, a pump capacity of 1000 gal. per min. of water for an output of 1500 tons of crushed stone per day of 10 hours.

These pumps are, for the most part, single-stage, double-suction, horizontal type centrifugal pumps, direct-connected to squirrel-cage induction motors. A number have ball bearings instead of the older type bronze sleeve bearings, with the motors also ball-bearing, which construction cuts down the friction losses and improves the efficiency of the unit.

Economies Possible

Also as a further means of improving the efficiency of the pumping operation, oversize piping is used at some of the plants for both suction and the discharge lines, to cut down the friction losses in the pipes. For instance, when the pump outlet is 6-in., an 8-in. pipe is used, and where the pump outlet is 8-in., a 10-in. pipe is used. Swing check valves are also used at some of the installations in the discharge line just above the pump and also in the suction line to help hold the priming and the water in the lines when the pump is shut down. This applies especially to those installations where the pump is started and stopped by remote push-button control, or by a float.

Automatic Pump Controls

Most of the pump units which supply water for washing are arranged with automatic starters for push-button control so that they may be started and stopped either at the pumps or in the mill. The pumps are located in reference to the discharge flumes from the washing screens so that the wash water has a good chance to settle out the fine material and clear up before being used again.

At a number of the plants the dewatering pumps are equipped with an automatic starter and push-button control in connection with a float so that when the float rises to a certain determined high water level the pump is started, and is stopped when the float falls to a determined low water level, thus making the unit entirely automatic.

Washing of at least part of the crushed stone sizes is done at 60%, or 18, of the plants in this group. All sizes are being washed at seven of the plants; sizes up to 1½-in. (Nos. 3, 4 and 6) are washed at another; and sizes up to 1-in. (Nos. 4 and 6) are washed at the other four. No washing is done at 12 of the plants.

Cost of Pumping

Since the cost of pumping is usually an appreciable item and, in some cases may be as much as 10% or more of the total

Wash water and fine material deposited in foreground

cost of producing crushed stone, it might be in order to mention a few of the ways in which this cost may be reduced.

First, cost may be reduced by the use of modern centrifugal pumps. Considerable improvement has been made in recent years in pump efficiencies, so that some of the new lines which have been brought out have an efficiency of 75 to 80% or even more, whereas many of the older centrifugal pumps have an efficiency of only 55 to 60%. This is because the new bronze impellers are more carefully designed and the workmanship on them is better.

In the case of an old pump it is apt to be cheaper to replace it with a modern one than to continue to use it, although this may be determined fairly accurately by comparing the power costs of the old and new types of the same capacity over a period of time, and taking account of the installed cost of the new unit. Also the efficiency of the old unit may be checked by measuring the amount of water and the height to which it is lifted, in foot-pounds, and reducing this to horsepower, which divided by the motor input in horsepower would give the overall efficiency.

Pipe Sizes Should Be Liberal

Along the same line, pipe sizes should be used which will be most economical when considering the greater cost of the larger pipe as against the reduced power cost with such larger pipe, and as a rule it will be found that it will pay to have the piping slightly larger than the pump outlets.

Friction in the pipes is also materially reduced by using long bends and long sweep fittings. A swing check valve is better than the ordinary foot valve and gives less trouble from small pieces of stone holding it open, and this may often be placed just above the water line for ease of inspection. The strainers usually furnished with foot valves are too small and become clogged too easily, so that it is much better to make a large one of perforated metal in order to cut down friction at this point and allow the pump to deliver to full capacity.

Pump house and pump in foreground

The double-suction pump is now used almost altogether as there is no friction from the impeller being crowded endwise as was the case with the old single-suction types.

How Much to Pump for Drainage?

Two other points making for economy in quarry drainage are: that the quarry should not be kept pumped any lower than necessary because of the increased lift and the increased amount of water coming in; and that the end of the discharge pipe going into the ditch should be bent down to give a siphon effect and thus reduce appreciably the head against which the pump works.

Where there is any appreciable amount of pumping the plant should have modern units with properly arranged piping, and when this is done the power consumed in pumping may be no more than half that with obsolete pumping equipment and poorly arranged piping.

Another recent development is the double squirrel-cage motor, which may be used without a compensator type starter, but with an across-the-line type starter, so that it may be thrown across the line through push-button control at any point.

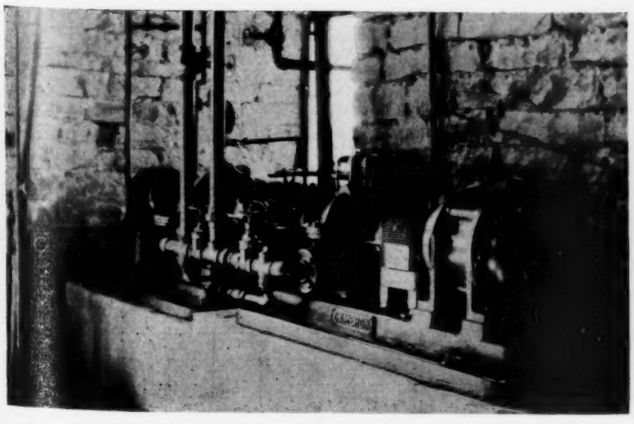
This type of motor is particularly adapted for use with centrifugal pumps, and is used satisfactorily in this way up to 75-hp. sizes.

This subject of pumps and piping in quarry work was covered in a most thorough manner in an article by D. W. Yambert in Rock Products of May 12, 1928.

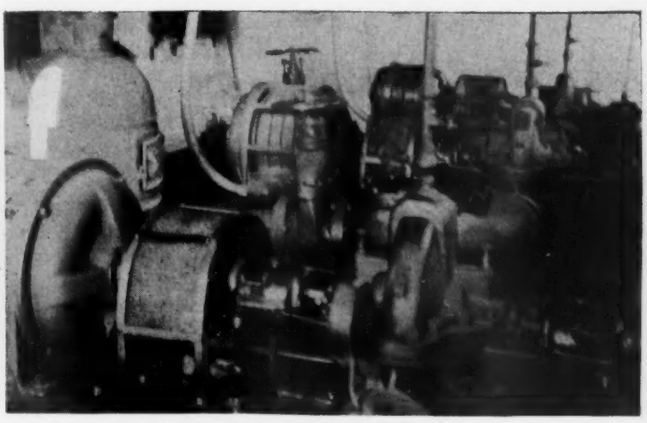
Water for Boilers

The matter of suitable soft water for steam boilers has always been more or less of a problem at quarries, since the water which filters through the rock is usually too hard for satisfactory boiler use. Hence, at some of the plants water for boiler use is obtained from a river or creek whenever available or from a sump or old quarry hole adjacent and so arranged as to collect surface water. It is considered a good investment to pump water from a river or creek even up to a distance of a mile or two, rather than use the hard water of the quarry. For this purpose small, motor-driven, centrifugal pumping units of the same type of 100 to 150 g.p.m. capacity with 15 or 20-hp. motors are used, controlled from the plant or automatically by a float.

(To be concluded)



Two small centrifugal pump units with direct-connected motors and full automatic control



Three modern centrifugal pump units with direct-connected motors and automatic starters

Gypsum and Gypsum Products Manufacture—Part VIII

Mixing of Gypsum and the Making of Special Plasters

By S. G. McAnally

Chief Chemist, Giant Portland Cement Co., Egypt, Penn.; formerly Chemist for the Pacific Portland Cement Co., Mound House, Nev., and Chemist and Superintendent for the Standard Gypsum Co., Ludwig, Nev.

AT SOME PLASTER MILLS the calcined gypsum is reground before going to the finishing or mixer bins. The modern practice is to do the grinding in one stage only and before calcination; the plaster usually goes directly from the hot-pit to the mixer bins, which also serve for storage. The use of concrete silos for storing the plaster appears to be a success; deterioration of the plaster due to such storage has not occurred to any great extent at the mills which have installed silos. The plaster is conveyed from the silos to the mixer bins. These are usually hopper-bottomed and are located above the mixing machines and packers. Fig. 8 shows the usual arrangement of these machines.

The plaster is fed into the cone-shaped hopper either from a chute located on the side of the bin, or from a screw conveyor running under the bin. The conveyor is preferable, as a better control of the feed and more accurate weighings are obtained. The hoppers are designed to hold 2000 lb. of plaster, but when the material is very finely ground they will barely hold 1800 lb. When admixtures are added to the plaster, it is absolutely necessary that the batches be measured by weight and not by volume. A slowly filled hopper will hold much more than one that has been filled rapidly; and coarsely ground material occupies less volume than finely ground material.

The retarder, or accelerator, or other ingredient, is weighed accurately on a scoop balance, and separate balances are used for each ingredient. The ingredients are added to the weighed hopperful of plaster and the batch is dumped into the mixing compartment below. Here the materials are thoroughly mixed by being agitated by two sets of paddles attached to two parallel horizontal shafts which rotate rapidly in opposite directions.

Time Allowance for Mixing

The minimum time allowed for thorough mixing should not be less than 1 min. Satisfactory results have been obtained with ½ min. mixing, but it is safer practice to enforce a minimum of 1 min. from the time all the charge is in the mixing compartment until the gate of the latter is opened to allow the finished product to discharge into the packer. The packer forms the lower portion of the complete unit. Here the product is sacked in cloth or in paper sacks.

The principal stages in the manufacture of ordinary gypsum plasters are grinding, calcination and mixing. All are equally important, but mixing is the one that requires constant attention. The errors that may occur in mixing can pass unobserved at the plant, but the consumer will realize them when he finds that the plaster either sets too quickly or will not set at all.

In some other industries, in which different materials are mixed to produce other products, the mixed batches are blended by being stored in bulk storage bins prior to packing. This intervening storage permits the batches to be mixed, more or less, with each other, so that, should a few of them lack a necessary ingredient or contain too much of it, the error is minimized.

Each Batch Handled Separately and Sacked Immediately

In the manufacture of gypsum plasters, it is customary to sack each batch as soon as it is mixed. It is impractical to sample and test each one, and irregularities sometimes pass unnoticed until the product reaches the user. Only one batch (20 sacks) in a shipment may be bad, but all the plaster in the shipment will be regarded with suspicion and perhaps condemned.

Errors in mixing are due to faulty mechanisms (leaky gates or slides), failure of the mixer-man to add the necessary ingredients to the calcined gypsum, or to his adding twice the necessary quantity. In the last mentioned case, the mixer-man, due to a lapse of time in his regular routine of mixing, forgets that he has already added the retarder or accelerator, whichever it may be, to the batch, and he repeats this operation. To those who are not familiar with the mixing operation, the above error may appear inexcusable. However, it should be explained that, with the exception of retarder, most of the chemicals added to plaster are somewhat similar in color to the latter; and, all of them, including the retarder, either settle, or sink, into the plaster or get covered by the dust which permeates the air in the vicinity of the mixer; this dust settles on top of the charge in the weighing hopper and obliterates the presence of the admixture.

By the adoption of a proper routine, performing each step in a methodical manner and not deviating from the cycle of operations, the human errors can be prevented. The various steps in a system, used with beneficial results at several plants, are enumerated below. We may assume that the various mechanisms are in operation and that the slides or gates in the weighing hopper and in the mixing compartment are closed. The various steps, some of which must necessarily be repeated in the enumeration, are as follows:

1. Fill the hopper with the unit amount of plaster.
2. Weigh necessary chemicals, etc.
3. Add the latter to the weighed hopperful of plaster.
4. Dump hopper charge into mixing compartment.
5. Close gate or slide on hopper.
6. Fill hopper with unit amount of plaster.
7. Weigh necessary chemicals, etc.
8. On signal from sackers (and if charge has been mixed for at least one minute), open gate, or slide, of the mixing compartment to discharge into packer.
9. Add chemicals, etc., to the weighed hopperful of plaster.
10. Close gate of mixing compartment after allowing sufficient time for the latter to empty.

It will be noted that the chemicals are not added as soon as they are weighed, nor as soon as the hopper is full of plaster, but only when the charge in the mixing compartment is emptying into the packer. The benefits to be derived from the strict application to these routine steps can be realized and appreciated only by trying out the system.

Need Strict Weighing Rules

The installation, at some gypsum mills, may not permit the use of the above system; facilities, such as automatic weighing of the plaster, may be lacking; much time may be consumed, and an additional man may be required to weigh the retarder, fiber, etc., and carry them to the hopper. This may cause confusion unless there is a rule that

the retarder, etc., must be added only to the *weighed* hopperful of plaster. After all, retarded fibered hardwall constitutes the bulk of the calcined gypsum products, and it is the one in which the lack or the excess of retarder causes the most serious trouble.

A scheme devised by the writer to be used in the mixing of fibered hardwall was, to have the retarder and the fiber balances close enough to each other to permit the pans, or scoops, being tied together with two or three feet of light chain. With this arrangement, the fiber and retarder must be carried and added to the plaster in one step. The presence of the fiber on top of the charge, or on the fiber-picker, if such is used, shows that the retarder has been added.

The irregular setting time of a retarded or an accelerated plaster may be due to leaky slides or gates in the weighing hopper or in the mixing compartment. Leaks in the latter permit the calcined gypsum (as distinguished from the finished product) to enter the packer and cause un-uniform setting time of the batches. Leaks in the hopper gate permit the calcined gypsum to dilute the charge in the mixing compartment with respect to the amount of ingredients required in the finished product.

Leaks in the hopper, if not observed visually, can be discovered by checking the number of sacks of plaster obtained from each of several batches. Leaks in the mixer gates can be noted by visual inspection. Leaky hoppers will cause retarded plaster to set quicker than normal, but samples from the same batch will set uniformly. Leaks in the mixing compartment gates will cause irregular sets in samples from the same batch.

How to Handle Spillage

There is one other matter connected with the mixing operation and that is the manner of handling the spillage from the Bates valve packers. This material falls into a trough or hopper below the packer and is returned to the mixing unit by means of either a small bucket elevator or by a suction fan connected to a dust collector. The point to which I wish to draw attention is the necessity of returning the spillage to the mixing compartment and not to the weighing hopper. The amount of spill is not uniform in quantity. If it is returned to the hopper, it becomes part of the unit weight of plaster (2000 lb. or less) and will cause slower and irregular setting time. To make this clear, let us assume that the unit weight of plaster is 1800 lb. and that 9 lb. of retarder is added; this is equivalent to ½ lb. per 100 lb. of plaster. If 100 lb. of spillage (which contains ½ lb. retarder) is returned to the hopper during the interval of filling the latter, only 1700 lb. of calcined gypsum will have been added to make up the 1800 lb. The mixer-man then adds the 9 lb. of retarder and the batch now contains 9½ lb.; naturally, it will be slower setting.

TESTS ON SEVERAL BRANDS OF CASTING PLASTER

Brand	% fineness 100 M.	% fineness 200 M.	Setting time	Water ratio	Tensile strength, lb. per sq. in. ½ hr.	¾ hr.	2 hr.	1 da.	3 da.	7 da.
A	90.0	78.6	9 min.	53%	.....	187	206	.....	.....	.....
B	91.0	81.4	15 min.	58%	129	178	197	192	.....	.....
C	84.0	75.0	14 min.	59%	157	180	208	200	.....	.....
D	93.0	82.0	20 min.	59%	.....	208	212	205	.....	.....
E	92.0	.....	22 min.	63%	.....	197	215	222	.....	.....
F	92.6	78.2	7 min.	53%	.....	.....	.....	195	440	525
G	94.8	72.6	8 min.	60%	.....	.....	.....	161	280	480
H	99.8	86.8	17 min.	64%	.....	.....	.....	205	330	404
I	88.0	76.4	9 min.	54%	.....	.....	.....	220	272	540

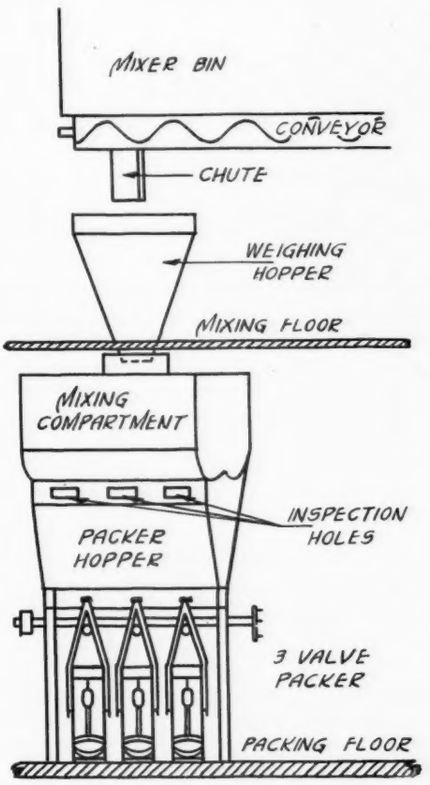


Fig. 8. Usual arrangement of bin, mixing compartment and packer

The next batch may contain very little spillage; hence the irregularity in the setting time between the individual batches.

Regarding the method of returning the spillage to the mixing compartment, the direct elevator is to be preferred. The large volume of air drawn in by fans partially aerates the plaster; aeration lowers the sand-carrying capacity. Another disadvantage in the use of a fan is that the collected material sometimes hangs up in the collector and may pass down into the mixer at a later period when some different product is being mixed. Frequently the pipe leading from the spill-trough to the fan becomes clogged; the sackers have to stop packing until the pipe is cleared. The elevator is more dependable for continuous operation; it returns the spillage directly to the mixing compartment without danger of excessive aeration or of contaminating other products.

Making of Special Plasters

The principal products of single-boil and double-boil stucco are: fibered and unfibered hardwall; finishing, casting, molding and dental plasters; pottery, button-lath and wallboard plasters. The base material for the above products is usually single-boil stucco. Formerly, double-boil was the base material for casting, finishing and dental plasters. The higher calcining temperature produced a denser and stronger product than ordinary single-boil. But the manufacture of double-boil stucco is no longer necessary. Stronger, denser and quicker hardening products can be produced from aged single-boil plaster.

A considerable quantity of single-boil plaster, without further treatment or the addition of admixtures, is shipped under the trade name of stucco or plaster of paris, basic casting, pottery, etc., and is used in the manufacture of wallboard, buttonlath, tiles, pottery molds, paints, calcimine, and various other products. Sometimes a small amount of retarder or accelerator is added at the mill in order to regulate the set to a specified time.

Casting, finishing and dental plasters are usually made from aged single-boil stucco. Casting is used for ornamental statuary work and for interior decoration. The setting time varies with the requirements of the different users. When necessary, the set is regulated by the addition of a small amount of retarder or accelerator. Set castings must harden quickly so as to permit of their being withdrawn from the glue molds in a short time. The casting manufacturer expects to use the same mold several times for the production of several castings of the same design; if the set plaster, or casting, heats excessively it will "burn" or melt the sharp edges of the glue mold; the result is a faulty casting and a destroyed mold.

TESTS ON SEVERAL BRANDS OF FIBERED HARDWALL

Brand	% fineness 100 M.	% fineness 200 M.	Setting time Neat	Setting time 1-3 sand	Tensile strength, lb. per sq. in. 1 part plaster, 3 parts Standard sand Water used	1 day	7 days	28 days
A	91.6	70.0	65 hr.	11 hr. 00 min.	12 %	178	540	490
B	94.4	74.0	14 hr.	4 hr. 00 min.	12½%	131	462	428
C	82.4	47.0	28 hr.	5 hr. 50 min.	12 %	118	390	395
D	95.8	86.0	50 hr.	8 hr. 10 min.	12½%	104	412	350
E	92.6	76.0	31 hr.	5 hr. 00 min.	14 %	100	372	362
F	86.0	72.0	27 hr.	4 hr. 30 min.	14 %	130	357	360

Finishing plaster contains from 1 to 2 lb. of retarder; the setting time varies from 1 to 3 hrs. In actual use, the plaster is mixed with about two parts of hydrated lime and is used for the smooth coat of interior walls. The main differences between casting and finishing plasters are in the setting time and in the degree of fineness; the latter product is the coarser.

Dental plaster is used in the making of plaster casts for plate work. It should be white in color, should not heat, and should set in about 5 min. Uniformity of set and absence of coarse particles is important. It is advisable to regrind the calcined gypsum to a minimum fineness of 85% passing the 200 sieve. Dental is made by adding a small amount of raw gypsum (8 to 12 lb. per ton) to cold double-boil plaster or to aged single-boil.

Fibered and unfibered hardwall plasters are made by mixing fresh single-boil stucco with a relatively large amount of retarder (4 to 12 lb. per ton), with or without fiber or hair, as the name indicates. The quantity of fiber or hair used is about 4 lb. per ton of plaster. Double-fibered hardwall contains between 6 and 7 lb. of fiber per ton. The setting time of neat pastes of various brands of these plasters ranges from 15 to 65 hours. However, hardwall plasters are always used in sanded mixtures: 1 part of plaster and from 2 to 3 parts of sand. Sand accelerates the set and in proportion to the amount added.

The kind of sand used is important, as it affects the set, the strength and the spread of the plaster. The accelerating action of sand on retarded plaster is responsible for many complaints of quick setting. No two sands are alike in this action. The setting time of the plaster when mixed with the same proportion of different sands can vary from 2 to 15 hours.

Setting time tests made on the same sample of fibered hardwall plaster mixed with 3 parts of sand, each sand being from a different source, gave the following results:

Sample No.	Setting time	Sample No.	Setting time
1	4 hr. 00 min.	7	4 hr. 30 min.
2	3 hr. 10 min.	8	2 hr. 00 min.
3	8 hr. 00 min.	9	2 hr. 10 min.
4	6 hr. 30 min.	10	1 hr. 45 min.
5	15 hr. 00 min.	11	3 hr. 40 min.
6	5 hr. 30 min.	12	2 hr. 45 min.

Tensile strength results, using four different samples of sand, in a 1:3 mix, were as follows:

Sample No.	Tensile strength, lb. per sq. in. 1 day	7 days
1	48	185
4	100	375
6	63	211
7	45	128

The fineness or the coarseness of sands, if they are from different localities, is not a guide to their accelerating property. Some coarse sands will cause quicker setting than fine sands, and vice versa. However, if the same sand is screened so as to give a coarse and a fine portion, the latter will cause the plaster to set quicker.

Washing the sand (and drying it) before mixing it with the plaster causes the mixture to set slower. Washed sands should be dried before they are mixed with the dry plaster. This is an important point that has been overlooked in the use of washed or damp sand. When *wet* or *damp* sand is mixed with dry plaster (and this operation requires several minutes), the moisture in the sand ages the plaster; aging lowers the sand-carrying capacity and slows the set considerably. When the mixing water is added to it the mixture appears "dead" and is, usually, very slow setting. The use of this wrong practice is responsible for many plaster complaints. Only dry sand should be used when the plaster and sand are mixed before adding the water.

(*To be continued*)

Re-Working Gold Dredge Waste for Gravel Held a Community Benefit

A CALIFORNIA gravel producer has broken into print, locally, with a sound argument about the local benefit derived from his company's operations. He has also used considerable space as a sales argument for his product. The producer is Ray Kennedy, manager, Bechtel-Kaier Rock Co., and his signed article appears in the *Oroville Mercury Register*. We reproduce it as a good example of the kind of local publicity producers can obtain if they go after it:

"A community prospectus is too often narrowed to the limits of its own immediate activity, and great energy is wasted in strengthening or building a hub to support a massive expanse of commercial or industrial development, prematurely.

"It has been said that no community center can grow beyond limits established by the area and activity of the back country for which that particular center is a feeder; thus a census of back country possibilities is essential for the effective planning and building up of any hub community.

"The Oroville back country industries, agricultural, horticultural, animal husbandry, and mineral activities, etc., are too little credited with their just proportion of contributing factors. This is probably true for two reasons, first lack of interest, and second lack of knowledge on the part of the people at large.

"The complete upheaval of surrounding fertile lands by huge gold dredges in the past was for the time being a contributing agent to the prosperity of Oroville through the medium of a large circulation of money mostly in the form of pay roll. This was no more lasting than the property area which could be profitably worked.

Some 200 Acres Cleared

"The Ghost Town angle of this activity was thwarted purely through the good fortune of there having been a desirable quality attached to the rock so removed from the depths of the ear under the once cultivated surface. This was capitalized upon by a company specializing in the production of gravel and crushed rock products, who have been operating for more than twenty years in a more or less quiet way, commanding no further interest or comment from the community than a possible belief that such a place was to be shunned, because of the dust and noise.

"More enlightenment has resulted, however, the past two years, due to a second rock company establishing operations. In a very spectacular manner this company built one of the largest producing plants west of Chicago, and in the approximate two years operation has cleared about 200 acres of the unsightly dredge tailings making possible the rehabilitation of that land and its restoration to the rank of a constant producer.

"During this two year period more than two million tons of rock products have been handled. The value of this operation can better be understood by illustration. Consider the rock products valued at $1 per ton. About 70% of the production costs go directly into labor and the pay roll is spent entirely in the community.

Good Quality Rock

"Railroad ballast in the central states and other localities where hard rock does not exist, readily pulverizes under the action of tampers, traffic, etc., making its replacement necessary every few years. The harder rocks resists this pulverizing, and maintenance and replacement costs vary from one-half to one-tenth of the former similar costs. The Oroville rock is very much favored for this reason.

"Automotive highways and other roads necessitate complete replacement, or equivalent maintenance, in some cases every four years, compared to a similar replacement every 10 to 12 years for Oroville rock.

"When used in cement concrete there are many advantages. Oroville rock when properly graded at the plant can be made to produce a concrete that will stand a compression load equal to 5000 lb. per sq. in. of concrete. A concrete made from ordinary river run materials, not properly graded, is very often a waste of money, inasmuch as designers would not allow a load of more than 400 lb. per sq. in., seldom if ever would they allow a load of 600 lb. per sq. in. which is about one-eighth as good as the graded material."

Los Angeles Cement Plant Project Suddenly Revived

EVIDENCING the determination of Alphonzo Bell and his associates to go through with their projected installation of cement quarries and limestone grinding plants in the residentially-zoned Santa Monica hills, Bell engineers on February 16 had completed the laying of a pipeline across the beach and into the ocean at a point near the junction of Beverly boulevard and the Coast highway north of Santa Monica, near Los Angeles, Calif.

The pipe was laid by Bell employes during Saturday night and before dawn Sunday morning, in the mist of driving rain and a heavy wind storm.

Later, the pipe will be connected with other units that will constitute a line running from the proposed site of the quarries and rock crushers in the hills, to a distance off-shore, where a tanker anchorage, supported by buoys, will be constructed.

Through this line the Bell interests propose to conduct liquefied powdered lime rock that they expect to blast and quarry from the Santa Monica mountains. At the off-shore anchorage, the plan is to load the liquid lime rock, known as slurry, into tankers.

The tankers then will carry the slurry to a cement mill, which, the Bell interests have said, will be located somewhere at tidewater, between El Segundo and Balboa Beach.

J. McLane Tate, chief engineer for Bell, when he was asked why the pipe had been installed in the dead of night, explained that Sunday was the only time that he was able to obtain a barge and tugboat to conduct the operation.

The job was completed six hours before darkness fell Sunday evening.

By the means of automobile headlight illumination, the workmen labored in the rain and the wind, employing a portable crane, a pneumatic hammer and the barge and tugboat to install the pipe.

The pipe is 8 in. in diameter. Through it Bell has proposed to run enough limestone slurry to operate a cement mill of 5000 bbl. daily capacity.

For more than two years Bell's efforts thus to industrialize the Santa Monica hills was fought by thousands of home owners in the district. Bell, however, now holds a permit from the city council to go ahead with the plant and the quarries.

Once before a Bell crew employed the hours of darkness in carrying out the pipeline construction. This was in 1929 when a first link of the line was built under the coast highway one night during a rain. When the residents who were fighting the Bell project awoke in the morning, the highway had been cut, the pipe installed and the dirt thrown back in place again.—*Los Angeles* (Calif.) *Herald.*

Marquette to Provide for River Shipments at La Salle, Ill., Mill

A WATERWAY PROJECT under which the Marquette Cement Manufacturing Co. proposes to transfer bulk cement from railway cars to river barges at a point just west of the Burlington depot in Peru, Ill., and by means of a barge line distribute its products to down-river and Mississippi river points, including St. Louis, was revealed when the company applied for approval of its transfer plan before a meeting of the Peru city council recently.

According to a spokesman for the Marquette company, the operation of a barge line out of Peru is to start as soon as the danger of ice is removed and continued navigation is assured. In the meantime the Street and Alley committee of the city council, along with City Attorney Helmig, will confer on minor technicalities involved in the matter of jurisdiction over the river frontage involved. This committee was empowered by the council to grant the permission sought by the industry, unless some question of major importance should arise.

The trans-shipping point selected is just west of the Burlington station, the council was informed, with the explanation that arrangements had been made with the railway for the necessary sidings. No buildings are contemplated, for the present at least, and barges brought upstream would be loaded by means of cement-pumping equipment which would remove the bulk cement from railway cars and transfer it to the boats by means of large rubber hose. Dust and other like features are rendered impossible by the nature of the transfer equipment.

The mayor expressed himself as heartily in accord with the plan, adding that in his opinion it should have every encouragement in line with the city's interests.—*Peru* (Ill.) *Herald.*

Feldspar in Pennsylvania

BULLETIN M-13, by Ralph W. Stone and H. Herbert Hughes, recently published by the Topographic and Geologic Survey, Harrisburg, Penn., reports on the available deposits and present condition of the feldspar industry in the state.

According to this report, feldspar occurs, so far as known, only in the southeastern corner of the state in or near Chester and Delaware counties. The investigations by the survey indicate that although the feldspar production of Pennsylvania has been slowly decreasing as compared with other localities, the deposits of the state are not exhausted and that in all probability many pegmatite dikes will still be discovered.

The bulletin is also illustrated with cuts showing the location of the known deposits and their nature.

In 1920 the production was 8500 tons, having a value of $81,000. Since then there has been a decrease in tonnage and value.

Gold Medals for Old Employes of Northwestern States Cement Company

"I DON'T THINK there is a business in America more highly competitive than the cement business," declared Colonel Hanford MacNider, president of the Northwestern States Portland Cement Co., before 300 employes at the annual company banquet at Hotel Hanford, Mason City, Ia., recently.

"It is the ambition of the Northwestern to keep the plant running, not seven months, or nine months, or eleven months, but the entire year," Colonel MacNider said.

Gold medals for men who have been employed by the company 20 years, and silver medals for employes of 10 or more years were presented by Colonel MacNider.

Twenty years and over men honored at the banquet were: F. E. Smith, L. S. Atkinson, A. M. Ikenberry, W. J. Birch, H. S. Seevers, Ora Pringle, Charles J. Keel, Sidney Birch, M. E. Richardson, B. B. Jones, Henry Sims, T. H. Stetler, Martin Peterson, J. F. Lynch, P. A. Danielson, R. H. Meyer, W. C. Thompson, J. E. Meyer.

Gold medals were presented to the five employes of the 1931 honor roll made up of those who have worked with the company 20 years. The men were Richard Burgraff, Hans M. Hanson, James Haunches, E. H. Minott and Alf Nelson.—*Mason City* (Ia.) *Globe-Gazette.*

Use Michigan State Cement Plant as Dormitory for Convicts

SEVENTY INMATES of the new Michigan state prison, Jackson, Mich., were transferred to the cement plant barracks at Chelsea, recently, to relieve crowded conditions.

Warden H. H. Jackson stated that the transfer to Chelsea was the only alternative to placing cots in the corridors of the main institutions, which is considered undesirable practice. The men sent to the cement plant will have no regular employment for the present as the plant is operating on an exceedingly light schedule.

The state prison inmate count was up to 5,418 at the time and officials were still awaiting the arrival of paroles from Lansing. The courts are sending practically all convicted men to Jackson, as the Ionia and Marquette prisons are loaded beyond their capacities.—*Jackson* (Mich.) *Citizen-Patriot.*

* * *

The state would be given authority to sell the Chelsea cement plant under a bill introduced today by Representative Dexter G. Look, of Lowell, in the Michigan state legislature. The cement plant was purchased by former Governor Alex Groesbeck, in 1923, at a cost of $625,000. The plant now shows a deficit of $661,000. The bill sets no definite price at which the plant shall be sold.—*Detroit* (Mich.) *News.*

Sand and Gravel Research Reviewed

By Edmund Shaw
Contributing Editor, Rock Products

THE REPORT of the Engineering and Research Division of the National Sand and Gravel Association, which was presented by Stanton Walker, director of research, to the fifteenth annual convention of the Association, has an introduction which includes much that should be familiar to ROCK PRODUCTS' readers, because it is much the same as Mr. Walker's article in the January 17th issue. There are, however, some matters on which the present writer would like to comment. One is that statement that:

"Carefully controlled tests of different aggregates, falling within the range of quality of those commonly used for concrete, indicate that differences in flexural strength of approximately 25% may be caused by aggregate characteristics other than grading, soundness, or deleterious substances. Surface texture and strength of particles stand out as the most important factors. Angularity plays a relatively unimportant role; its principal effect is reflected in the workability of the concrete rather than the strength."

The details of this research would be highly interesting to all of us who are interested in the "physics of concrete." It is noteworthy that the part played by surface is just now beginning to be appreciated and more than one investigator is engaged in studying its problems. To be sure, Edwards and others understood very well the part played by surface in a broad way and he attempted to reduce it to a mathematical basis by establishing a surface modulus. But Mr. Walker's statement would show that something more than a mere measurement of visual planes or a calculation of theoretical surface is necessary. The characteristic called "texture" is merely a matter of roughness and smoothness, as applied to aggregates. And "roughness" means only that there is relatively more surface exposed on a "plane" of the same area. We are just beginning to appreciate how very much greater the surface exposed by "roughness" over the exposure of smooth surfaces may be. The investigations of Dr. Martin and Gross and Zimmerley on the surface exposed in crushing show that there may be four or five times as much "invisible surface" as there is "visible surface" in crushed particles. It takes water to wet this so-called invisible surface which alone would be enough to affect the strength of the concrete, regardless of any question of bond.

Regarding proportioning, the report well says that the results in concrete depend in a large measure on the method of proportioning used. We have had some very good examples of that in the tests of the last two or three years. It is obvious enough now that any comparative tests of aggregates made with concrete of fixed proportions merely test the concrete for those proportions and no others. It is the oldest rule of research that only one variable at a time may be tested. Hence, any test of the characteristics of aggregates made with differing cement factors, water-cement ratios, gradings, percentages of voids and so on (as they are when arbitrary mixes are tested) have not much value in a theoretical way. They merely show that one aggregate gave a stronger concrete than another with the particular proportion of materials that were used.

Characteristics of Aggregates Only Variable

Mr. Walker has tried to eliminate every variable but the characteristics of the aggregates. The cement factor is kept constant and also the mortar-voids ratio, since this seems to be a proper criterion of workability. The water-cement ratio is allowed to vary, in fact it must vary if the workability is constant, as the only way the characteristics of equally sound aggregates can vary the characteristics of concrete is by varying the water-cement ratio. Mr. Walker notes a limitation in this method of designing, the fact that a mortar-voids ratio which may be satisfactory for one size may not be satisfactory for another. It is difficult to see how this limitation can be overcome except perhaps by a study of many examples that will permit a general curve to be plotted that may be used for adjustment when tests are to be interpreted. It would seem quite feasible to do this while we are waiting for a satisfactory workability test, which seems long in coming.

In a later paragraph Mr. Walker speaks of the usual test by which sand is compared with Ottawa sand for mortar strength. His experiments have shown that small changes in the mixing water, "not enough to change the consistency of the mortar outside the range used in this test, resulted in a change in strength ratio of from 98% to 120%." And tests on the effect of the pressure of molding briquets showed strength ratios varying from 90% to 105%, and the pressures used "were within the limit of those which might occur with several different operators." After reading this, one wonders how often it happens that a really good sand is turned down because of a mortar test made with a trifle too much water and not given sufficient pressure in molding. Even with substances so much alike as two sands, the "feel" on exerting pressure might be so different that one sand would be unconsciously given a greater pressure than the other by the operator. Of course, now that delimitors and burette measurements of water are used, tests may be more carefully conducted. But using all the refinements possible, it is still true that the ordinary strength test of sand is as much a test of the accuracy of the water-cement ratio law as it is of anything.

Work upon sands, as Mr. Walker says, has hardly been begun. It seems to the reviewer that some very simple and obvious facts about sand have been more or less neglected. One is that which Mr. Walker points out, that sands exert a much more important effect on the quality of concrete than do the coarse aggregates. He might have gone farther and said that the gradation of the finer sizes of sand was more important than that of the coarse. In other words, it is the present writer's firm conviction, confirmed by the observation of the way that concrete stiffens up when the amount of fines in the sand is even slightly increased, that the importance of gradation increases as the aggregate becomes finer. The other obvious fact is that with large voids in the coarse aggregate it is better to use a coarser sand, thus avoiding the lack of Dr. Kriege's "missing link." Common sense ought to show us that the easiest way to fill large sized voids is to fill them with fair-sized particles.

Valuable Work on Ballast

One is glad to see the work that is being done on gravel ballast, not only because of its value to ballast users but because we need the knowledge of those factors that make for stability, to be used with concrete and bituminous mixtures. Although the report does not say so the method (the use of an expanding cylinder with calibrated springs) was not arrived at without a great deal of study and experiment. It is a valuable contribution to the methods of testing aggregates.

The report of the research laboratory is by C. E. Proudley, assistant director of the Engineering and Research Division. In a list of work published, the item that will probably be received with as much interest as any is Series 8, "Effect of Mineral Composition and Shape of Particles in Coarse Aggregate on Strength of Concrete." It is in this investigation that the method of proportioning referred to above is being used. The cement factor and the mortar-voids

ratio are kept constant in all the samples of one series. Mortar-voids ratio of 1.75 and 2.00 have been used so far. The writer has noted from the study of previous tests from this laboratory that a mortar-voids ratio of 1.75 does not seem to be too high for the best strength and workability. One would like a little information on this mortar-voids ratio. Gray's method of proportioning concrete, published in the *National Sand and Gravel Bulletin* about a year ago, calls for a mortar-voids ratio of 1.6 in all cases. The Georgia Highway Department (Rock Products, January 17, 1931, p. 52) uses a "surplus sand factor," which is an added volume of sand to the volume of voids. This surplus sand factor for gravel is 0.14, for stone 0.15, and for slag 0.16. The sand being in all cases constant, the mortar ratio would vary according to the voids. Assuming a yield of 1.25 for 35% voids in gravel, the sand would be 0.40+0.14 and the mortar-voids ratio would be 1.75. For 40% voids the mortar-voids ratio would be 1.69. One would fancy the workability would vary accordingly. More information on designing concrete by the mortar-voids ratio would be welcome.

Stone Prepared to Simulate Gravel

In this series referred to, the high grade crushed stone is being rounded in the Deval machine to simulate gravel. This is an interesting feature of the test, as it is an attempt to remove still other variables than those included in the cement factor and water-cement ratio. It is perhaps somewhat questionable whether a freshly crushed piece of rock and a piece that has been hammered to roundness in the Deval testing machine would have the same physical characteristics, other than shape, with many rocks; but they probably would come much nearer to it than would any samples of natural gravel and stone from different sources. Why would not the same results be secured by selecting crushed and uncrushed gravels from the same deposits? Certain Wisconsin deposits in which all the larger pieces are of hard dolomite ought to furnish material for such an investigation.

Labor Involved in Testing

It is a good thing to give the outline of the tests that have been made and their number, as this report does. Those unfamiliar with laboratory work have little idea of the planning and labor involved in making such tests as those that are carried out in the laboratories of the National Sand and Gravel Association and the National Crushed Stone Association and the members would place a much higher value on the information that comes to them through bulletins and magazine articles if they knew how much hard work it represented. One wishes that every member might visit the laboratories and offices in Washington to understand this better.

A list of the samples sent in shows some of the uses to which sand and gravel are put as well as the wide range the work of such a laboratory must have. It includes: concrete sand, building sand, foundry sand, unclassified sand, concrete gravel, gravel ballast, filter gravel, gravel for airport surfacing. Beside these samples, 10 samples of crushed rock, 2 of cement, 2 of bituminous materials, 6 of concrete, and 1 for identification of minerals, were received and tested.

That the laboratory and its work is appreciated by the members is shown by the fact that 41 different companies and others availed themselves of the laboratory's services at least once, and some of them as many as four times. Four out of five samples received were submitted by members and the others came through the direct influence of member companies; 86% of the samples were materials to be used in concrete, mortar or plaster, and by far the greater part of these were to be used in concrete.

The Sodium Sulphate Test

One of the most interesting portions of Mr. Proudley's report is the "Proposed Method of Test for Soundness of Fine and Coarse Aggregate," which has been developed and used in the Association's laboratory. No originality is claimed for it and credit is given to the U. S. Bureau of Public Roads, the Portland Cement Association, the National Crushed Stone Association, and Dr. H. F. Kriege, of the France Stone Co.'s laboratory, for information and suggestions.

The procedure is too long to be printed here in full. An abstract of its main features is as follows:

The solution shall be prepared by dissolving either the anhydrous or crystalline salt of sodium sulphate (about 0.9 lb. of anhydrous or 2.0 lb. of crystalline required for 1 quart) in water at about 30 deg. C. (86 deg. F.). Solution shall be allowed to cool at 21 deg. C. ± 2 deg. (70 deg. F. ±4 deg.) and shall stand at least 12 hr. before use.

Recommended convenient size containers are of enamelware, 6 in. dia. (or square) and 1¾ in. deep for fine aggregates and 9 in. dia. (or square) and 3 in. deep for coarse aggregate. They should be provided with covers and at least ½ in. of solution should cover the aggregates.

The sample of fine aggregate (passing ⅜-in. sieve) shall be of such size that approximately 500 g. is coarser than 50-mesh. It shall be thoroughly washed and dried to constant weight and then sieved with Nos. 50, 30, 16, 8 and 4 sieves. The minus 50 portion shall be discarded, the other separations tested, each in a separate container.

The coarse aggregate sample shall be thoroughly washed and dried and any portion passing No. 4 sieve discarded. Pieces showing incipient fracture due to crushing should be removed. Size of sample depends on maximum size, as follows: ⅜-in., 500 g.; ¾-in., 1000 g; 1½-in., 3000 g; and if more than 15% is coarser than 1½-in., 4000 g.

The sample shall be separated over sieves with ⅜-in., ¾-in. and 1½-in. square openings and each fraction tested in a separate container. The number of particles shall be counted in the fractions coarser than ¾-in.

Sufficient solution shall be added to each fraction of sample to cover it ½ in. The containers shall be covered and stored at 21 deg. C.±2 deg. (70 deg. F.±4 deg.) for 18 hr. A moist room such as is used for storing concrete specimens is suggested as convenient. The presence of a few sodium sulphate crystals in the container is desirable as an indication that the solution is saturated.

At the end of the 18-hr. period the solution shall be decanted or siphoned from the container and the samples, in the containers, placed in the drying oven previously brought to 100-110 deg. C. and dried to constant weight, or for not less than 4 hr. After cooling to room temperature they may again be immersed in the solution as described above. Unless otherwise specified five cycles constitute a test.

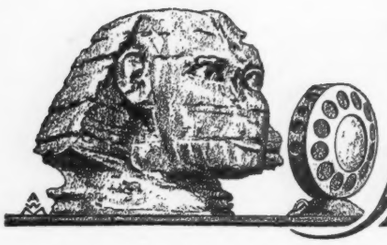
Qualitative and quantitative examinations shall be made of fractions coarser than ¾ in., quantitative examinations only of finer fractions. For the qualitative, the effect of and the nature of the action of sodium sulphate solution shall be observed and the number of particles affected shall be counted. Qualitative examination shall be made with the sample immersed, before removal for drying. Splitting and disintegration should be noted.

After the final cycle the sample should be given at least four washings in warm water, and fine aggregates and those of high absorption may require more. Then each fraction shall be dried to constant weight and weighed and screened over the sieve on which it was retained before the test, the weight and amount passing being recorded. Then all sizes and the detritus are combined and passed over these sieves, Nos. 100, 50, 30, 16, 8, 4, ⅜-in., ¾-in., 1½-in. The cumulative per cents on each sieve should be recorded.

These Facts Recorded

The report should consist of the following:

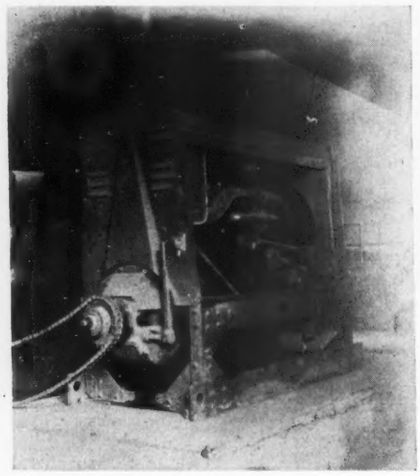
(a) Weight of each fraction of sample before test. (b) Number of particles in each fraction of sample coarser than ¾-in. before test. (c) Number of pieces affected after each cycle, in fractions coarser than ¾-in. only, classified as to number disintegrated and number split. (d) Material from each fraction of sample, finer than sieve on which fraction was retained before test, including failed particles which did not pass, expressed as per cent by weight of fraction. (e) Weighted average of per cents of loss for sample calculated from results for each fraction. (f) Sieve analysis and fineness modulus of sample before test. (g) Sieve analysis and fineness modulus of entire sample after test.



Hints and Helps for Superintendents

Emergency Kiln Drive

AT THE Hull, Que., plant of the Canada Cement Co., Ltd., the single 374-ft. x 10-ft. x 10-ft. 3-in. Unax rotary kiln used is normally driven by a variable-speed electric motor. For insuring continuous operation during an emergency, the kiln is provided



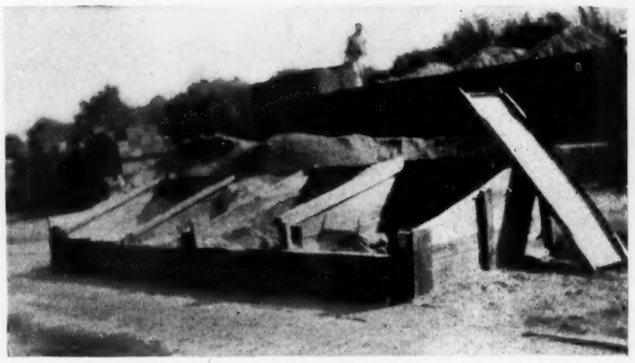
Auxiliary kiln drive insures operation in emergencies

with an auxiliary drive consisting of a Type YTU, Buda, 42-hp., 4-cylinder gasoline engine that drives the kiln through a Hans-Reynolds sprocket drive. This is a simple and economical method of insuring continuous operation of a rotary kiln in case of emergency.

Obtaining Exact Weights for Material Loaded to Trucks

WHERE A PRODUCER is selling his material directly to contractors or other users he frequently is called upon to deliver exact weights of material for batching purposes. Unless his bins are fitted with weighing devices he must guess at the amount put on the truck and then have the truck weighed after it leaves the bin. If the load is appreciably under-loaded the truck must return to the bin, thus consuming not only the truck's time but also the time of the man loading at the bin. On the other hand, if the load is too heavy some of it is usually thrown off and wasted.

To overcome this difficulty, a box with four or five compartments in it may be placed right beside the scales at the office. Such a box is shown in the illustration, where each compartment is large enough to hold nearly a half yard of material. The box is partially filled with material, each compartment having one particular size. Then when a load is slightly underweight a few shovelfuls of material is thrown in from the correct compartment. Likewise if the load is overweight, some of the material is thrown into the right box and the load is thus brought down to correct weight. The truck stands on the scale all of the time so there is no time lost. Where this scheme is in use a large scoop shovel is employed which will hold approximately 25 lb. of sand, gravel or stone, as the case may be. Hence four to eight shovelfuls would change the load 100 to 200 lb. and should be sufficient to bring it to the exact weight required, with the least waste of time or material.

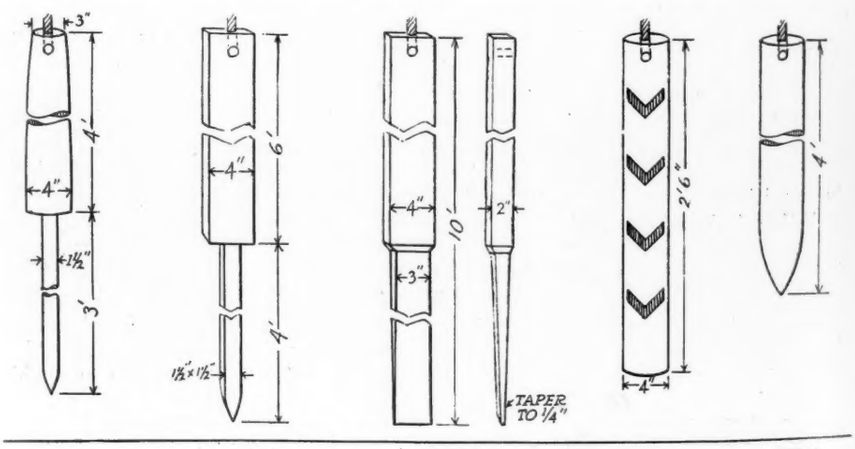


A box with several compartments for various materials is placed beside the plant scales

Tools for Unplugging Dynamite in Well-Drill Holes

IN QUARRIES where well-drill blasting is practiced, a tamping block is usually a part of the equipment, although it is rarely used today for the purpose for which it was first introduced. According to J. W. Koster in one of the *Service Bulletins* of E. I. du Pont de Nemours & Co., in earlier days it was the belief that in loading a well-drill hole both the dynamite charge and the stemming had to be tamped at frequent intervals in order to secure the best results from a blast. For this purpose a hardwood block was used, ordinarily about 4 in. in diameter and 7½ ft. long, and this was suspended on a 1-in. rope of sufficient length to reach to the bottom of the hole. Sometimes the block was weighted with babbitt.

Experience has shown, however, that such tamping is ordinarily unnecessary and undesirable. When the large-sized cartridges now used in well-drill blasting, up to 7-in. by 24-in., are dropped into the hole, their own weight causes them to spread and fill the hole so as to exclude air spaces and give compact loading. The sand or fine screenings generally used for stemming also packs to sufficient density simply by being poured into the hole. In fact, some blasters and superintendents do not permit a tamping



These tools can be used for freeing a stuck dynamite cartridge in well drill holes

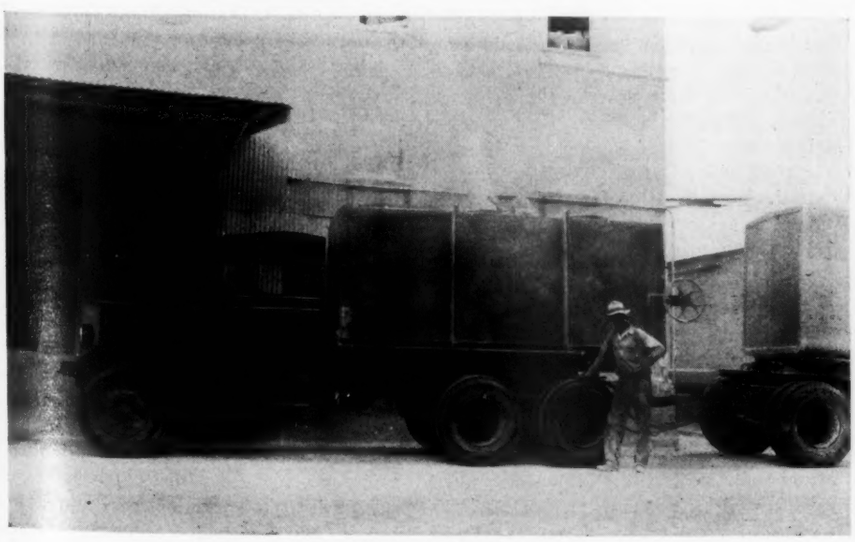
block to be put into the hole unless the hole becomes plugged. In this case the old cylindrical type of block is not the best tool to clear the hole and several modified shapes have been designed for this purpose which are much more effective.

At all times, clearing a hole plugged with dynamite is an operation which must be handled with care, and with a full understanding of the danger involved. Compression of a thin film of dynamite between the tamping block and the walls of the bore hole, and friction against such a film, may start a premature explosion and therefore the tool used to break through the dynamite bridge should be of such a shape as to avoid this hazard. Fig. 1 shows a very effective tool for clearing plugged holes which has been used for a number of years in the quarries of the John T. Dyer Co. near Birdsboro, Penn. The reduced and pointed bottom section, 1½ in. in diameter and 4 ft. long, will punch through the clogged dynamite rather than drive it down by compression, while the shape and length of the upper section tend to force the point to strike near the center of the dynamite.

Hauling Bulk Plaster by Trucks

THE SCHUMACHER WALL BOARD CO., Los Angeles, Calif., purchases all its stucco requirements from independent mills. The stucco is loaded to tanks mounted on six-wheel trucks by means of a suitable spout and is discharged in the same manner by an ordinary dump truck. Rack-and-pinion gates are provided on both the truck and trailer to control the discharge rate of the stucco. About 18 tons of stucco is hauled by the truck and trailer, a round trip distance of about 48 miles. These bodies are made of sheet steel although aluminum bodies were soon to be used so that a larger net load could be hauled.

This rather novel method of transporting plaster no doubt could also be used for handling cement or bulk lime and the present users are very well satisfied with the method as it has eliminated all trouble and labor incidental to cleaning and returning sacks, labor of filling and dumping sacks, etc.



This novel method for transporting plaster is used by a western gypsum products producer

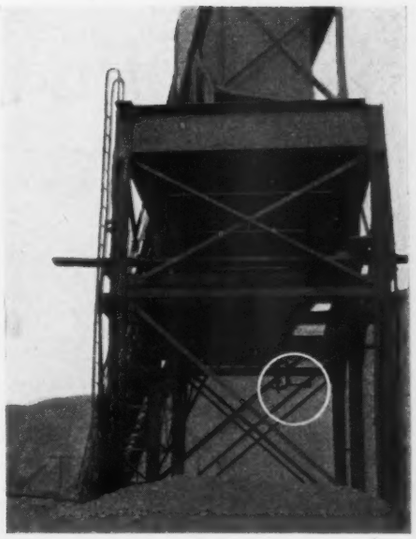
Automatic Car Loader

THE Pioneer Sand and Gravel Co., Seattle, Wash., secures its gravel and sand from one of the most extensive deposits in the United States. A 4-cu. yd. electric shovel loads to a field hopper serving a belt

The car has opened the gate and is being loaded

conveyor. The belt conveyor discharges to a second hopper that is used to load cars serving the plant, some distance away.

Cars holding about 12 tons each drop down the incline from the plant and pass under the loading hopper, and in doing so the car engages a projection fastened to the



The pan type gate under hopper is closed by the car

hopper's discharge gate in such a fashion that the pan type sliding gate opens and allows the car to fill. Sufficient time is allowed for the car to fill after which the hoist operator at the plant pulls the car up the incline, the gate in the hopper being closed automatically by the car as it passes from under the hopper. There is no danger of the car running over while loading for the opening in the gate is such that the back-up effect of the sand and gravel controls the amount loaded to each car.

Ballast for Setting Up Stiff Leg Derricks

By W. L. Home
Mining Engineer, Tenafly, N. J.

A CONTRACTOR who operates large numbers of stiff leg derricks uses specially prepared cast-iron weights to hold down the stiff legs. In a great many cases this would appear to be far more efficient than the usual method of wooden cribs filled with stone or other ballast. In some circumstances this certainly would not be worth while. Yet, where an operator's work is localized and he is continually tearing down and setting up derricks, this scheme must save considerable time and expense. Also, he secures a maximum amount of weight in a minimum amount of space and has a job which is neat and pleasing to the eye.

The weights are iron castings approximately 1 ft. x 1 ft. 4 in. with a recess in the top side with a bar across the recess the top of which is flush with the casting. The recess and bar are sufficiently large so that a hook from a crane can be quickly and easily secured. These blocks are put into position by the crane that sets up the derrick, and are placed in position as a solid crib.

Sand-Lime Brick Industry in Europe*

In Switzerland Sand-Lime Brick Is Rapidly Displacing Clay Brick—In Germany Used as Auxiliary Material for Paving as Well as for Buildings and Walls

(Compiled in Minerals Division from Reports by Consul General Ernest L. Harris, Vienna; Consul Alfred W. Donegan, Munich; Consul General L. J. Keena, Paris; Vice-Consul Cavendish Welles Cannon, Zurich, and others)

SAND-LIME BRICK, unlike brick which requires certain types of clay, and therefore is produced only in regions furnishing such material, can be manufactured wherever crushed stone and lime or siliceous sand can be brought together economically. Its manufacture has reached a high technical development in Switzerland, where it is rapidly displacing clay brick. Although the materials used are somewhat more expensive than clay, less labor is involved. Clay brick is generally cheaper, as there are extensive clay deposits. It is largely used, however, only as filling for walls, sand-lime brick being preferred for the exposed layer.

In Germany sand-lime brick have been manufactured steadily for more than 30 years, and especially in the postwar period. Development is most conspicuous in northern Germany and other sections where there are large sandy tracts. Large deposits of clay and the relative scarcity of sand in southern Germany, especially Bavaria, have given clay brick a dominant position in that region.

Economic Success in France and Austria Apparently Temporary

Sand-lime brick began to be of importance in France in 1919, when there appeared an urgent need for building material requiring a minimum time for manufacture and delivery. At the same time hundreds of presses, which had been used for compression of metal shavings from arms and munitions, ceased to be of any service to their owners, and it is estimated unofficially that about half of them were taken for manufacture of sand-lime brick, while many of the others were used for cement-clinker and ordinary clay brick.

The French industry was stimulated for several years by the shortage of labor and capital, and also by the drop in the exchange value of the franc, which enabled many industries to show paper profits for a time. Since then activities have declined and no technical progress has been noted, in spite of continual experiment at the Conservatory, the equivalent of the Bureau of Standards in the United States.

In Austria sand-lime brick, manufactured near Vienna, several years ago were sold at a somewhat lower price than clay brick, and had a large local demand, but the three factories were purchased and closed by the municipality as a matter of policy. Recent experiments show a renewed interest, and as most of the reported results were favorable, it is not unlikely that manufacture subsequently will be resumed; in fact, the erection of a new factory is planned. One of the arguments against sand-lime brick advanced in Vienna is that it tends to absorb moisture, and, consequently, to scale in periods of sharp frost.

Variation in Characteristics—Special Uses in Switzerland

Although the applicability of sand-lime brick is somewhat dependent upon climate as well as regional custom, a more conspicuous consideration is the comparative price of raw materials for it and clay brick. In addition, there is some variation in the characteristics of sand-lime brick according to the raw materials available. In Switzerland it is reported that the most obvious superiority of sand-lime brick is that its surface is not subject to saltpeter exudation, but it is considered more important that it has excellent insulating qualities and great compressive strength, or resistance to crushing. Sand-lime brick are regarded by the Swiss as particularly suitable for exterior walls, partitions in subterranean and other damp areas, and for tunnels, bridges, and paving.

Sand-lime brick as marketed in Switzerland is a gray product, consisting of cleaned, crushed gravel mixed with 3% to 4% high-grade fat lime. It is understood that a Swiss company operating in France has found a high-grade silica sand which produces a very good brick without the addition of lime. The mixture is fed into forms assembled in strong revolving presses, where the bricks are hardened artificially under high steam pressure, for 10 hours, and are then ready for use. There has been no demand in Switzerland for colored or texture bricks of this material. but coloring would be a simple process, although adding to the cost. The leading Swiss manufacturer for many years had a prejudice against hollow building materials, and until two years ago manufactured only solid bricks. Now it has added two types with air cavities, which offer advantages in improved insulation and reduced weight. Sizes are determined by the usual building demands.

Organization of Swiss Manufacture and Trade

The combined production of the four important Swiss firms manufacturing sand-lime brick amounts to about 130,000,000 brick yearly. Schedules conform to the building demand, and at least two of the plants have facilities and capital to increase their capacity indefinitely. They are well organized and use the most modern equipment. While sand-lime brick is a chief item of production, other lime, cement, and, sometimes, tile products also are produced.

It is essential that plants should be located where crushed stone or gravel and lime are easily available, and facility in distribution of the product is also important. In the Zurich district most of the plants are at the upper end of the Lake of Zurich, and the bricks are transported on large barges to a well-equipped port in the city. Handling charges have been minimized—a rather unusual factor as regards European building materials.

In the past the costs of production have been calculated roughly as involving more expensive materials and cheaper processes than the manufacture of ordinary brick. Actual costs vary with the facilities for delivery, and also with the rate of production, intermittent operation being more expensive. The labor cost varies somewhat, but this is a minor consideration in a modern plant. Electric power is available everywhere in Switzerland. The largest Swiss plant works on the basis of a production cost of about $7.40 a thousand. Colored brick would cost about a third more.

Present Trends and Market Outlook

The firms manufacturing sand-lime brick in Switzerland are well capitalized, and neither raw material nor labor involve serious problems to the industry. In view of the high transportation costs and the facility with which sand-lime brick can be produced in other areas, no attempt has been made to export, although tests appear to have established a superiority of the Swiss product over the German. The high level of prosperity maintained in Switzerland for many years, only slightly affected by the present depression, seems to assure continued building activity, the only restrictions being limitation of area and population.

Research and experimentation have brought

*From *Commerce Reports*, U. S. Department of Commerce.

sand-lime brick manufacture to a point of standardization adequate for present needs, and no changes in formula or methods are understood to be contemplated. The product is now sufficiently well known to have almost the maximum consumption. Switzerland, however, has only seven cities with a population above 50,000—their total about 850,000—leaving nearly 80 per cent of the inhabitants in small towns or rural districts, where brick are not used in large quantities. In Italian Switzerland brick construction is very unusual, and it has made progress outside the larger towns only in recent years. Quantities of sand-lime brick are demanded at present for public building. They are used with reinforced concrete in the construction of the new Federal Post Office at Zurich.

German Demand for Sand-Lime Brick—Comparison With Clay Brick

Sand-lime brick are now included among the standardized building materials of Germany, and their appearance makes them especially desirable for facework on buildings. There is a somewhat wider opportunity for the use of clay brick. Domestic sand, the basic material for the sand-lime brick, is much more uniform in its composition than local clays. The sand-lime brick, however, has all the properties necessary to make it a first-class masonry brick for walls and similar construction. In Germany it has been used successfully in many types of construction, including use as an auxiliary material for paving in districts where stone is not readily available. It is not adapted for use as a direct road surface, however, as it is not sufficiently resistant to abrasion and shock, but it is regarded as a highly satisfactory base for asphalt or tar mixtures.

The chief component of the sand-lime brick is the product of disintegration of quartzose rock. This sand must be relatively pure, sharp, and of varying granulations in order to promote coalescence. The best binding medium is considered to be fat white lime, which increases in bulk with slaking, filling the pores of the mixture. Sand-lime factories usually obtain this binding material from lime works, which extract the caustic lime from the natural limestone. It is important that the lime should slake rapidly and be free from foreign matter. In the large factories the slaking process is accelerated by power and steam. Steam is required for hardening the bricks in all factories, and, as a source of power it takes first rank. The use of electric units, however, is increasing in the larger plants.

French Requirements

Sand-lime brick, where available at a reasonable price, has an excellent reputation among French architects, contractors, and others connected with the building trades. The French product is of a creamy white color, with smooth, apparently semivitrified surface. It can be obtained in qualities which withstand higher crushing tests than the best clay brick. For economy in buildings where brick of low-crushing test is adequate, the clinker-cement brick is used. It is made with the same sort of press as the sand-lime brick but does not go through the steaming process.

The cost of manufacture of sand-lime brick is 10% to 15% higher than that of clay brick, when the raw materials are at an equal distance, but this is partly offset by the smaller loss through warping, shipping, and other causes. In addition to the higher price, sand-lime brick is handicapped seriously if the plant is remote from an active building center. At present there seem to be only 3 large sand-lime brick plants in operation—2 located in the suburbs, having cheap water transportation to Paris, and the third at Montmorillon. The only method of manufacture of sand-lime brick now in use in France is that of cold mixing of sand with hydraulic lime.

Other European Countries Have a Growing Sand-Lime Brick Industry

Development of the sand-lime brick industry is said to be growing rapidly in the Netherlands, Czechoslovakia, Poland, Hungary, and especially in Russia, where a large number of factories have been erected on the banks of the Volga. These brick are reported to be increasingly popular in the Netherlands for construction of villas. In Austria there has been recent experimentation with improved machinery and processes for manufacture of sand-lime brick, intended to reduce heating time and fuel, and also to make production costs about 10% less.

New Molding Sand Project in Ohio

THE JONES SAND CO., of Wooster, Ohio, producer of molding sand, is opening a pit on the Nelva Carpenter farm about a half mile south of Killbuck, Ohio, and is making preparations to erect a building to house machinery in the near future.

A contract for the construction of a 26-by 50-ft. building has been let to A. H. Uhl. This structure will be called the mill building to house grinding machinery. The company will use a 30-ton steam shovel in digging the sand from the pit and expects to employ at least eight men when it completes its structural work and gets under full operations.

The fine sand which will be produced by the company is taken from the bottom lands near the creek and after being mixed and ground, is used by foundries.

Work is expected to be begun in a few days on building a spur-track from the railroad to the company's lease.—*Millersburg* (Ohio) *Holmes County Farmer-Hub.*

Sand and Gravel Producers at Odds Over Freight Rates to Milwaukee

ANOTHER ATTEMPT is being made to organize sand, gravel and crushed stone producers in Milwaukee county, Wisconsin, to stabilize prices and prevent ruinous competition. This was stated by D. J. Retzlaff of the State Washed Sand and Gravel Co., a witness at the final hearing on the application of the Milwaukee, North Western and North Shore roads for a reduction of 25% on freight rates on sand, gravel and crushed stone to Milwaukee from specified points in this state outside of Milwaukee county.

The demand of outside producers for lower rates so they can get into the Milwaukee market is the result of ruinously low prices in Milwaukee, Mr. Retzlaff said. If the producers get together and put prices on a reasonable level, lower freight rates will not be necessary, he said.

Stabiiization of prices in Milwaukee will not help the situation, F. H. Cull of the Kenosha Sand and Gravel Co., with a pit at Silver lake, 50 miles from Milwaukee, testified.

"Sand and gravel producers will not stick together," said Mr. Cull. "There is always someone who will jump the fence and the others are forced to protect themselves. Unless the railroads are enabled to meet truck competition they will lose business."

Mr. Cull said that sand and gravel can be trucked 20 miles for less than rail freight rates. He favored a flat reduction of 14c a ton on the rate to Milwaukee instead of a percentage reduction.

Among other witnesses heard were Harry Gillies, commerce agent for the North Western road; J. K. Jensen, Janesville Sand and Gravel Co.; J. N. Thouvenell, president, Pacific Sand Co., Portage, Wis., and W. K. Clow, Waukesha Lime and Stone Co.

Mr. Gillies said his company wants to regain sand and gravel tonnage lost to trucks and that if truck competition is eliminated the company is willing to withdraw the application for rate reductions.

Mr. Jensen said his company has lost business in Milwaukee to local concerns which are delivering by truck. The Milwaukee industry is not on a sound basis, he said, because of a popular belief that it is an easy business to get into. Pit equipment and truck concerns offer outfits for small payments down and people get into the business without knowing costs, he said.

Mr. Thouvenell favored the reduction but objected to that part of the application which exempted silica and core sand from the reduced rates, his company producing them. This would be rank discrimination, he said.

The hearing ended late February 27 but was left open for filing of briefs. P. H. Porter of the railroad commission presided. —*Milwaukee* (Wis.) *Journal.*

Progress Toward a Better Comprehension of the Nature of Concrete

American Concrete Institute's Annual Meeting Develops Some Points of Value to Cement and Aggregate Producers

IT SEEMS SOMETIMES as if "progress" in concrete engineering and construction consists largely in making what apparently is obviously a simple subject as complex and complicated as possible. The industry has had no lack of researchers, but it has lacked generalizers who could reject or interpret widely separated research and draw a few understandable practicable principles from it. In this respect the discussions at the annual meeting of the American Concrete Institute, at Milwaukee, Wis., February 24-26, were more helpful than usual.

The Institute is designed primarily for engineers and designers of concrete construction, yet there was much in its deliberations of interest and value to producers of cement and aggregates. What follows in the way of an abstract of and comment on the proceedings is confined to this angle of the meeting.

Workability of Concrete

Workability of concrete mixtures is something of very great interest and value to producers both of cement and aggregates, because workability or flowability is really the virtue most desired in a concrete mixture, and undoubtedly more concrete work has been shabbily done because of the desire to have a mixture that was easily placed than through any other cause. Moreover, a mix that is properly designed to be workable makes a concrete of good quality; and since the producers of cement and aggregate are vitally concerned with the quality of concrete, they should be interested in an understanding of "workability."

The discussion hinged on three papers which have been pre-printed in the *Journal of the American Concrete Institute* and, therefore, were not read at the convention.

Two of these papers had to do with methods of testing the workability of mixed concrete which, as probably most producers know, are the flow table method and the slump test method. Two pairs of research workers came to practically opposite conclusions regarding the effectiveness of these tests.

George A. Smith and **Sanford W. Benham** of the Johns-Manville Research Laboratories, Manville, N. J., concluded as a result of their tests, that: "The data on the whole indicate that, where a consistent indication of the consistency or wetness of concrete is desired, the flow test is preferable to the slump test because of its more nearly uniform functioning. Because of easier action and greater sensitiveness to change in wetness the 15, ⅛-in. drops are to be preferred to either the five or the ten, ½-in. drops."

Inge Lyse and **W. R. Johnson** of the research laboratory of the Portland Cement Association, Chicago, Ill., concluded: "All data included in this series of tests show that the slump gives a more suitable indication than the flow of the increased workability of concrete produced either by enriching the mix or additions of admixtures. The results also indicate that the slump should be taken with no shaking of the concrete. The flow, however, remains about constant for the different number of drops on the flow-table so that any number is about equally suitable for the test. The use of five, ½-in. drops of the flow-table would seem to be as satisfactory as the use of 15, and would not noticeably shorten the test."

These two papers were discussed by several practical engineers, and the contrariness of the results pointed out. That neither test is adequately designed to show a mixture which will not result in segregation was commented on at length.

The third paper of the series on "Workability" was a discussion on the effect of admixtures by **G. M. Williams**, professor of civil engineering, University of Saskatchewan, whose conclusions on the basis of workability alone would indicate the use of an admixture to be dependent mainly upon the relative cost of cement and admixtures, and that the use of admixtures would not be economical unless their cost were less than twice, in specific instances, and less than five or six times, in other instances, the cost of portland cement. He also stated that consideration should be given to the fact that cement not ony increases workability as an admixture but at the same time it definitely increases strength and impermeability.

Incidentally, Professor Williams gave one of the best definitions of workability in stating that it meant, "the ability of a mixture to remain homogeneous and free from segregation during the process of transportation and placement."

Proper Gradation of All Ingredients the Secret of Workability

Dr. F. O. Anderegg, consulting chemist and engineer, Pittsburgh, Penn., gave a very short, clear picture of how segregation, flowability, workability and consistency of concrete are all related and how "beautiful" results could be obtained by starting with a properly graded cement and carrying on through properly graded fine aggregate and properly graded coarse aggregate, in practically an unbroken line.

In other words, the concrete ingredient should start with the finest particles of cement and the component particles gradually increase to the largest size of coarse aggregate with no breaks or gaps, following a logarithmic or straight-line grading, which is also the grading which gives the best packing of particles. By taking into account that the purpose of an admixture is to supply the gaps in the grading of the cement, it is obvious that admixtures would be beneficial to some cements but not to others, which were better graded; also where the finer sizes of fine aggregate are missing, the admixture may serve to fill the gaps in the grading of the fine aggregate.

S. C. Hollister, professor of structural engineering, Purdue University, threw some light on the subject by pointing out that the workability of freshly mixed cement paste changed on standing; that the addition of water to cement does not mean merely a mixture of water and granules but something more, that chemical changes take place which produce a colloidal gel which materially affects the workability.

At this point, **P. H. Bates**, United States Bureau of Standards, rose to his feet to say that he was glad to see at last some physical chemistry being injected into the study of concrete for it had long been known and recognized that setting of cement involved a phenomenon of colloids.

Properties of Mass Concrete

The report of Committee 108, **Raymond E. Davis**, professor of civil engineering, University of California, and **G. E. Troxwell**, assistant professor of civil engineering, University of California, on "Properties of Mass Concrete" was a very scholarly presentation of some of

the considerations which must be taken into account in the hardening of concrete in large masses. The report pointed out that most of our experimental knowledge of concrete setting is based on laboratory experiments with relatively small specimens whereas the conditions in the interior of a large mass of concrete are entirely different. If these actual conditions were taken into account, and the relatively high temperatures obtained in the hydration and setting of cement are considered, it is quite likely that what is most desirable for this type of work is a special *slow hardening cement* rather than the quick-hardening cements toward which all developments in the industry point at the present time. In other words, the so-called improved cements of the present moment are not at all the kind desirable for mass concrete work because they hydrate too rapidly and develop too much heat.

The work of this committee includes tests on probably the largest concrete test specimens ever made, calling for 12x12-ft. cylinders containing approximately 50 cu. yd. of concrete each.

Segregated Sizes of Aggregates

One session of the Institute held in conjunction with the Engineers' Society of Milwaukee consisted of a symposium of three papers on "Field Practices in the Use of Multiple Sized Aggregates in Portland Cement Concrete Mixtures." **T. C. Thee,** assistant highway engineer, Division of Management, United States Bureau of Public Roads, Washington, D. C., said that three states, California Washington and New Jersey, now require coarse aggregates to be shipped in two separated sizes. The Wisconsin state highway department has gone even farther than this and in 1930 tried out shipping in three sizes and on one job in four sizes. Through the use of aggregates in two sizes a bag of cement per batch of concrete could be saved and better concrete resulted. When more than two sizes were shipped, Mr. Thee came to the conclusion that the extra cost of handling the aggregates about equalled the saving in cement.

A. L. Hambrecht, construction engineer, Wisconsin state highway commission, described in greater detail the use of four separate sizes of coarse aggregates, making out a very strong case for the segregation of aggregates in this way.

George W. Langley, county engineer, Sheboygan county, Wisconsin, and engineer in immediate charge of the job on which four separate sizes of coarse aggregate were used, elaborated still further on the advantages of using aggregates so separated and showed how in four years, by using segregated sizes, first two, then three and finally four, he had reduced the cement per cubic yard of concrete from 1.6 to 1.25 bbl. and, at the same time, increased the compressive strength of his concrete 40%. The saving in cement amounted to 6½ cents per square yard of paving. He also suggested a 3½-in. maximum size for the coarse aggregate. He disagreed with Mr. Thee that two sizes of coarse aggregate are sufficient and stated there should be at least three sizes. He stated that the water-cement ratio with a properly graded aggregate became more or less automatic.

It is obvious, if the results obtained on this road in Wisconsin are sufficiently advertised and similar results are obtained elsewhere, that the practice of requiring producers to ship in two to four separate sizes will become practically universal; as apparently there is no dispute in regard to the quality of concrete resulting from such a method of design.

Ready-Mixed Concrete

The reports of the committees having to do with ready-mixed concrete gave a very comprehensive discussion of all the factors involved in the design of plants and the specifications of the product itself.

A few of the high points of the report on design of plants by **Frank I. Ginsberg,** vice-president, H. O. Penn Co., New York City, are as follows: Use of bulk cement is developing rapidly and various methods are being developed for handling it in bulk. Cement should be handled in a separate bin and weighing device. He leaned rather a little, apparently, to the use of pneumatic conveying systems, stating it is desirable to have an air compressor about the plant in any event.

The cement bin should be supplied with special gates, especially designed to be water-tight and moisture-proof, and the plant should provide for handling more than one kind or brand of cement. The weighing hoppers or batchers should be 50% larger than the batch to be made.

In the delivery and distribution of ready-mixed concrete he made one suggestion that we have not seen made before, and that is, central-mix plant producers may co-operate by pooling the use of their trucks and obviate one of the drawbacks to central-mix business, that is, the necessity of providing equipment for peak production, which probably may be idle at other seasons. The necessity of adequate control of the product was particularly emphasized, and the signal system from the office to the plant was recommended as better than the telephone system, being less confusing to the operator. A well equipped shop for repairs to equipment was also recommended.

Obviously these are only a few of the points touched upon in the report which was very complete as to details of plant design and equipment, and is something that all prospective producers of ready-mixed concrete should consult before going into the business.

The same applies to the specifications for ready-mixed concrete which were considerably revised at the convention as compared with the original report of the committee published in the February, 1930, issue of the *Journal of the American Concrete Institute*. The changes had to do largely with mixing and transportation of the material. No time limitation for the material in transit was agreed upon, but one hour recommended.

F. B. Hamilton

F. B. HAMILTON, former chemist at the La Salle, Ill., plant of the Alpha Portland Cement Co., died on February 20, 1931. Mr. Hamilton's death followed a long illness and ended a brave battle against declining health which caused his retirement at the close of 1929.

His retirement culminated nearly 25 years of service with the portland cement industry. Mr. Hamilton at one time was an assistant chemist at the Copley, Penn., plant of the Lehigh Portland Cement Co. and later assistant at the company's Mitchell, Ind., plant. His next position was as chief chemist at the plant of the German-American Portland Cement Co., at LaSalle, Ill. Later he went with the Henry Cowell Lime and Cement Co. as chief chemist of its plant at Cowell, Calif. Mr. Hamilton then returned to his former position with German-American and continued with this plant after it became a part of the Alpha organization.

Mr. Hamilton's death occurred at LaGrange, Ill., where he had made his home for the last eight months. He was born in Brooklyn, N. Y., on February 28, 1867, and is survived by his widow as well as a son and a daughter and three grandchildren.

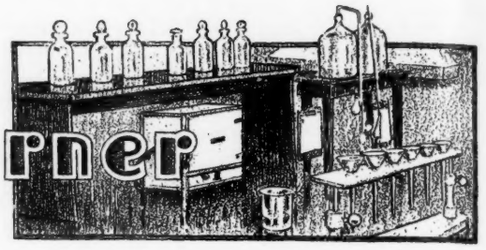
Frank K. Hoover

FRANK K. HOOVER, one of the founders and head of Hoover and Mason, engineers, Chicago, Ill., and of the Hoover and Mason Phosphate Co., Mt. Pleasant, Tenn., died March 6 at his home, 4841 Woodlawn avenue, Chicago. He was 77 years old. He is survived by his widow, Mrs. Effie Hoover, and two sons, Ray Phelps Hoover of Evanston and H. Earl Hoover of Glencoe.

Born in Canton, Ohio, Mr. Hoover, upon graduation from college, went to Kansas City, Mo., where he later became president of the Kansas City Edison Co. In the early '90s he came to Chicago, organizing the engineering firm with which he was associated until his death.

He was a Shriner and belonged to the Union League Club and South Shore Country Club.

The Chemists' Corner



A Tentative Modification of the Free Lime Method

By H. R. Brandenburg
Chemist and Metallurgist, Concord, Calif.

A RELIABLE, yet speedy, method for the determination of free lime in portland cement and allied products has been sought for by chemists for years; such a method, besides serving as not only a desirable but in fact as a vitally necessary control method in the manufacture of portland cement, can also conceivably serve to yield information otherwise unobtainable.

A method answering this purpose was originally developed by Emley; in the course of time ably refined by Lerch and Bogue and thereby made available in a reliable form for such investigations in the portland cement industry.

With the latest published refinements as so conscientiously worked out by these investigators one can truly find no fault with the method from the standpoint of reliability.

Time Factor Important

The existing objection to the method resides in the enormous time consumption required to complete a determination, and this time factor has unquestionably proved the greatest deterrent towards the adoption of the method as a universally useful control method.

Meyers (Rock Products, Nov. 23, 1929) designed a special combination titrating apparatus involving continuous agitation of the sample under test, thereby reducing the time factor somewhat.

The writer for several years past and in the course of certain investigations has hopefully experimented with various methods promising quicker results, but these attempts always ended in disappointment and a return to the standard method.

The information thus obtained, however, did result in some gain after all and as appertaining to the free lime method proper resulted in the search for a reagent which would be soluble in the glycerol-alcohol mixture, which would increase the rate of solubility of CaO and yet be inert with respect to the components of a portland cement clinker and compounds other than the free lime.

According to the investigations of the writer, and as far as the relatively limited resources and time of an industrial control laboratory permit, it is evident that such a reagent has been found in barium chloride.

Barium chloride, made anhydrous by maintaining it for several hours at 140-150 deg. C., is cooled, ground and stored for use in bottles placed within a desiccator for additional protection.

The ammonium acetate solution used had a CaO value of .00625 grams CaO.

The glycerol-alcohol mixture, to which we will refer hereafter simply as the "mixture," consisted of 1 part glycerol U. S. P. and 5 parts absol. alcohol, denatured according to formula 2 B.

By agitating the tests hereafter named at room temperature and using 50 cc. of the mixture, certain interesting facts were developed.

For an agitating device we used the Ro-tap sieving machine by clamping to the eccentric base thereof a sheet metal holder capable of accommodating 6 flasks simultaneously.

1.0 gr. $BaCl_2$ dissolved in about 25 min.
0.25 gr. CaO dissolved to the extent of 72% in 2 hr. 35 min.
0.25 gr. CaO plus 1.0 gr. $BaCl_2$ dissolved completely in 2 hr. 15 min.
0.05 gr. CaO plus 1.0 gr. $BaCl_2$ dissolved completely in 1 hr. 15 min.

Generally, a small portion of the CaO will agglomerate into small balls which slow down the rate of solution beyond what it would be if some inert dispersive material were added.

From the foregoing tests it is evident that we may, at our selection, dissolve the barium chloride in the glycerol-alcohol mixture, thus rendering it fully effective from the moment that the materials under test are added to the mixture.

The addition of $BaCl_2$ is negative towards $CaCO_3$, MgO, gypsum, etc., hence does not affect the determination for free lime in the presence of these compounds, or with respect to gypsum in the percentages in which this compound occurs in a portland cement.

For the determination of the free lime proper I have practiced using 150-cc. Erlenmeyer flasks attached to a titrating stand patterned after the one used by Meyer but without the agitating feature thereof.

To guard against volume changes within the burettes due to temperature effects from the heating elements a specially designed sheet was placed below the burettes as a heat deflector.

Determinations were run both with and without the use of barium chloride for comparison; in all cases 1.0 gr. of material was used and whenever $BaCl_2$ was added to the test 1.0 gr. of this reagent was used (in solid form).

Standards were run using from .05 to .25 gr. of freshly calcined CaO with and without the addition of 1.0 gr. of solid $BaCl_2$.

Effect of Barium Chloride

In all tests wherein $BaCl_2$ is used as an additional product it will be noticed that solution of the CaO is extremely rapid and permits of the addition of the acetate solution in 2 to at most 5-min. intervals, care being taken not to run in an excess; also with the addition of $BaCl_2$ the end point is more pronounced and sharp.

It has been found that when using $BaCl_2$ as an additional product that the CaO values thus found are a trifle higher than those found by the standard method, but they are much more quickly obtainable and reproducible with a greater constancy of results than those of the standard method. We feel justified in hazarding the prediction that the results attained with the use of $BaCl_2$ will, with more thorough investigation be found also more nearly correct.

After the true end point has been reached in the presence of $BaCl_2$ the test may be boiled for an hour or more without developing further reactivity.

In general it was found that on mate-

rials requiring from 2.0 to 2.5 cc. of the acetate solution, the time requirement with the use of $BaCl_2$ varied from 25 to 40 min. to complete the determination as against 2 hr. 30 min. to 4 hr. by the standard method.

Materials requiring 5 to 6 cc. of the acetate solution required from 4 to 6 hr. by the standard method, whereas by the addition of $BaCl_2$ such samples were finished in periods ranging from 40 min. to 1 hr. 20 min.

Standards requiring by the standard method a minimum of 1 hr. 20 min. and exclusive of the final 1 hr. boiling period were finished in 20 min. and less by the use of $BaCl_2$.

I have come to the conclusion that with the use of $BaCl_2$, and after it is apparent that the end point has been reached, that a 10-min. boiling period thereafter is quite sufficient (for all practical requirements at least) to make sure that no color develops and that the result so obtained will coincide, or nearly so, with the result obtained by the standard method.

With the prolonged boiling periods (up to an hour) it may be found that a faint pink coloration will develop, which may require 2 to 4 drops for final discharge; thereafter no further color will devolop.

The method employing the use of $BaCl_2$, as stated, has been used successfully on clinkers, hydrated limes, plasters, etc.

Checking By Other Laboratories Invited

The modification, as herewith published, is in its rudimentary form released for further work, experimentation and, if necessary, refinement, to research laboratories desirous of and properly equipped to check the modification in all its varied details.

For practical purposes the modification will as it stands, I am sure, enable the cement plant chemist to check his free lime content in clinker with a gratifying degree of accuracy and at a great saving of time.

The rendition of tables showing the work in all its details, and other than the solution rate illustration cited, has been purposely omitted so that the method may be tried open mindedly by the investigator.

Another difficulty experienced in the standardization of the acetate solution by the standard method resided in the apparently unavoidably large percentage of losses of the standards due to their tendency to bump and eject materials through the condenser tube.

The difficulty appears to be attributable to the formation of a crypto-crystalline lime salt deposit (probably a glyceride) on the bottom of the flask.

Occasionally, also, the calcined lime formed scale-like masses which appeared to be covered by a protective film thereby resisting penetration and greatly delaying solution of the scales.

Glass beads, Ottawa sand and many other inert dispersive agents were tried to overcome this difficulty but I have found nothing better than the addition of approximately one gram C.P. precipitated calcium carbonate to the standard, .05 to .25 gr. CaO.

The addition of calcium carbonate is, of course, not necessary where $BaCl_2$ is used in the test, but its corrective action is mentioned for the benefit of those who have experienced similar difficulties and may wish to try it.

New York State Stone Producers Discuss Amalgamation with Gravel Men

AT A MEETING of the New York State Crushed Stone Association at Syracuse, N. Y., March 4, Harold V. Owens (Eastern Rock Products, Inc., Utica, N. Y.), a member of this association and of the Empire State Sand and Gravel Association, and a vice-president of the National Sand and Gravel Association, made a strong plea for a consolidation of the aggregate associations of New York state into one organization. He stressed the fact that stone, sand, gravel and slag were comparable commodities, that there was a duplication of efforts in three separate organizations both in the various states and in the Nation, and that already certain state organizations had recognized this fact and had consolidated. He further stated that by such unity, greater strength and prestige would be obtained, and added that he hoped the amalgamation could be effected immediately. A lengthy discussion on this proposal ensued. It culminated in the thought that committees from each association should first meet and discuss the matter in detail, after which they were to report back to their respective organizations, and the subject would again be taken up for discussion. The committee of the Stone Association is composed of President A. S. Owens, Secretary Geo. E. Schaefer, and Ex-President John Odenbach; and they will meet with the other committee or committees at a date not yet designated.

The meeting, which included a dinner, was held during the convention of the New York State Contractors' Association. In the absence of President A. S. Owens, who is sojourning in the West Indies, it was called to order by Vice-President H. J. Russell, of Glens Falls.

A short discussion developed in regard to the proposed state bonding law on materials. Most of the members had been in attendance at the sessions of the Contractors' convention earlier in the day at which time this matter was discussed, so it was unnecessary to devote much time to it during the meeting. The contractors are still vigorously opposed to such a proposed law, whereas practically all other interested organizations favor it. The joint legislative committee on lien law revisions, which is headed by Senator Fearon of Syracuse, has held numerous meetings throughout the state since last fall, and is expected to make its report to the legislature within the next two weeks. A bonding bill may be introduced, but at this date its passage and enactment into law seems problematical.

Chairmon Russell called upon John Rice, Jr., of the General Crushed Stone Co. to discuss the advisability of adopting a uniform sales contract similar to that recently adopted by the Pennsylvania Stone Producers' Association and the Pennsylvania Sand and Gravel Association. Mr. Rice, who is also a member of the Pennsylvania Stone Association, explained the form at some length, stating it had been adopted in Pennsylvania only after serious study and that it gave the desired protection to the purchaser as well as to the seller. After some discussion J. E. Cushing offered a resolution, supported by W. F. Borrman that the chair appoint a committee of five members to study the form and report back to the next meeting of the Association with their recommendations. Upon passage of the resolution, Mr. Russell appointed Messrs. John Rice, Jr., J. L. Heimlich, J. E. Cushing, John Odenbach and Mr. Kaiser.

The meeting was the best attended in a long time.

Wisconsin Mineral Aggregate Producers Organize Again

OTTO W. LUTZ was elected president of the Sand, Gravel and Stone Co-Operative Association of Wisconsin at the first meeting of the group held February 25. Other officers include: vice-president, L. Geharity; secretary, A. A. Retzlaff; treasurer, Henry Jaeger.

The organization, which is co-operating with the department of agriculture and markets at the University of Wisconsin, was formed to stabilize the present market for sand, gravel and stone products.

Twenty-five firms were represented at the meeting. Besides the officers, other directors are Bruno Kaestner, W. Palmer, H. C. Luedtke, W. Hartung and Ernest DeVos.—*Milwaukee* (Wis.) *Sentinel.*

New Ready-Mix Plant for Fort Worth, Tex.

THE FORT WORTH SAND AND GRAVEL CO., Fort Worth, Tex., is building a new ready-mix concrete plant, to be in operation about May 1. The equipment was designed and built by the Heltzel Steel Form and Iron Co., Warren, Ohio.

Recent Prices Bid and on Contracts Awarded

SOME RECENT PRICES BID on materials for public work, and prices in contracts awarded, are as follows:

Evansville, Ind.—The county uses approximately $20,000 worth of gravel each year on roads and $30,000 worth of stone.

Prices quoted were on deliveries to a number of stations where road repair work will be done.

Four companies bid on the gravel contract. They were: Koch Sand and Gravel Co., which quoted prices of from 70 c. to $1 per cu. yd.; Bedford-Nugent Sand and Gravel Co., 64 to 98 c.; Archibald Sand and Gravel Co., 65 c. to $1.05; Charles H. Pillman, 64 c. to $1.15.

Those bidding on stone were: Phil Frey, 75 c. to $1.75; Irvin Schweitzer, 83 c. to $2, and the Globe Construction Co., $1.54 to $1.78.

Commissioners took the bids under advisement.—*Evansville* (Ind.) *Press.*

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Muskegon, Mich.—The city commission on February 24 deferred placing the contracts for the purchase of gravel and cement in connection with bids which were opened.

The Wabash Portland Cement Co. with a bid of $18,000 for 10,000 bbl. ($1.80 per bbl.) was low bidder. Five local building supply concerns, the lowest of which is $1000 higher than the outside bid, petitioned the city commission not to award the business to the outside firm, stating that they would meet the low bid price.

The Markle Cement Co. and Oscar Nelson each submitted a bid of $19,200. The other bids were: Muskegon Building Materials Co., $19,400, and L. C. Monroe Co., $19,500.

The Construction Materials Co. of Ferrysburg, was low bidder on 20,000 tons of gravel. It offered to furnish the gravel for $31,500 ($1.57 per ton). Only one other bid was submitted and it was thrown out because it did not conform to specifications.—*Muskegon* (Mich.) *Chronicle.*

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Washington, D. C.—Prices for sand and gravel sold by two firms in Washington, D. C., have been raised and contracts on district and federal highway construction will increase in cost, district construction firms have been informed.

The price on sand was boosted recently from 55 to 85 c. a ton, while the price of gravel was raised from $1 to $1.30 a ton. The firms who made the raises were the Smoot and the Columbia Sand and Gravel companies.

It is understood the move was brought about through the purchase of the Columbia firm by the Arundel Corp., which for some years has been competing with the two local firms. The former prices were in effect about two years.—*Washington,* (D. C.) *Times.*

Toledo, Ohio—Determined to reduce costs by introducing a system of competitive bidding, the county commissioners hereafter will make all purchases of crushed stone for road repair. Heretofore the stone has been purchased by the county surveyor.

This decision followed vigorous protest by the Woodville Lime Products Co. and the Whitehouse Stone Co. against the action of the county surveyor, C. L. Sawyer, in sending out letters asking additional bids from companies whose prices originally listed on request with the commissioners had been high.

The two companies protested it was unethical and poor public policy to ask new prices and after first prices had been submitted, thereby permitting the firms having the high prices to bid again.

A second bid from the France Stone Co., in response to the surveyor's request, reduced its quotations for stone delivered on the job to prices ranging from 70 c. to $1.25 per ton. Its first quotation was $1.10 at the quarry. Commissioner Thacher pointed out that for at least three years the county has been paying the France company $1.10 at the quarry. He insisted that in the public interest the new low bids should be made public. Commissioner Winters objected, claiming the letter was to Mr. Sawyer and should be held confidential. Commissioner Thacher still insisted and finally obtained Mr. Sawyer's consent.

"If there is a stone war on, why should not the county take advantage of it to get low prices?" Commissioner Winters said.

"No," said Commissioner Thacher, "these other people come in in good faith and give us much lower prices for stone delivered than the county has been paying for stone at the quarry for three years. Now you want to let this same company that has been charging the high prices come in with a second offer. That is not ethical and not good policy." Commissioner Winters then withdrew his proposition.

The France firm, which has been selling stone at the quarry to the county for $1.10 a ton, in its second offer bid 70 c. a ton, delivered on the Whitehouse-Spencer, the Neowash and the Weckerly roads; 75 c. on the Obee and Midway roads; 85 c. on the Garden road; 90 c. on Schadel, Hertzfield and McCord roads; 95 c. on the Heller road; $1 on the Centennial and Glanzman roads; $1.05 delivered at Richfield Center, and $1.25 on the Douglas and Jackman roads.—*Toledo* (Ohio) *News-Bee.*

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Detroit, Mich.—The city will be loser by $25,000 if the common council fails to approve his award for a crushed stone contract to the France Stone Co., and instead re-advertises for bids, Commissioner Douglas Dow of the department of purchases and supplies warned.

The award of the contract for the season's requirements of the department of public works and the Detroit street railways had been protested by the Lakeport Supply Co., which claimed its bid was lower.

The Lakeport company, by the protest, is attempting to delay award of the contract until the Michigan Public Utilities Commission hears its argument against the 20 c. per ton cut in freight rates on this class of goods, scheduled to go into effect March. 10.

If it succeeds in having the freight rates put back to 70 c. a ton, new bids on crushed stone and slag will be that much higher, Commissioner Dow said, by all companies who bring the material to Detroit by rail. The Lakeport company brings its supplies in by water.

The Lakeport company bid $1.39 a ton for crushed rock and the France company bid $1.35. But the Lakeport company also put in a bid to furnish crushed stone to the Detroit street railway and a combination of 25% crushed stone and 75% slag to the department of public works. This was lower than the France company bid. Commissioner Dow rules this offer was unsatisfactory and awarded the contract to the France company.—*Detroit* (Mich.) *Free Press.*

Five Gravel and Stone Companies in New Southern Merger

THE MERGER of five sand, gravel and stone companies into a corporation with resources of $5,000,000 was announced February 27 by the heads of the new firm, the General Aggregates Corp., Memphis, Tenn.

A. J. Hoffman, Louisville, Ky., recently president of the Kentucky Stone Co., heads the corporation. W. W. Fischer, of Memphis, is chairman of the board.

The merged companies are: The Central Sand and Gravel Co., Memphis, and its subsidiary; the Greenville Sand and Gravel Co., Greenville, Miss.; the Ohio River Sand and Gravel Co., Paducah, Ky.; the Center Bluff Quarry, Princeton, Ky.; the Cerulean Stone Co., Cerulean, Ky., and the Camden Sand and Gravel Co., Camden, Tenn.

The corporation announcement said member companies dominate the production in the central south of crushed stone, sand, gravel, riprap and limestone used in construction of highways, railway right-of-way ballast and other building material.

Other details of the new corporation are given in the "Financial News" section of this issue.

New Silica Plant for West Coast

ANNOUNCEMENT of plans for the construction of a $150,000 sand plant for the Pacific Coast Silica Co. in Bryon, Calif., was made recently by S. D. Miller, of Pleasanton, vice-president of the company.

Mr. Miller declared that contracts have been closed for 100,000 tons of sand annually—*Oakland* (Calif.) *Enquirer.*

Editorial Comment

Needed—A Little More Mutual Tolerance!

The problem confronting nearly all industry and business today—of making a fair living profit in the face of large over-capacity and with numerous concerns starving for business—certainly is not a new one; only the attitude toward a solution of the problem by the average business man is new or different. From the dawn of history mankind has been accustomed to alternating periods of feast and famine; and mankind's first important step toward civilization was the accumulation of food and necessities in times of plenty to provide against want in times of dearth. Undoubtedly it was in this way that business and industry as distinct from mere cultivation of the soil and the raising of domestic livestock had their beginnings.

People in civilized countries no longer are driven by famine and want into forays of desperation against more fortunate neighbors. The life of our civilization and of society depend upon making better provision for their welfare. This is recognized as such a prime fundamental of government and of political economy that not a dissenting voice is raised against enormous expenditures for public works construction specifically to provide employment for labor.

But business, until very recent years, had not advanced beyond the crude, savage stage of society, in which one made the best of actual conditions uncomplainingly, be they feast or famine. In times of feasting—of shortage or lag in production—producers boosted prices and made all the profit "the traffic would bear." They allowed competitors to do the same; even more, they were not adverse to joining forces with their erstwhile competitors "for mutual profit." In times of famine, however, they fell away from their competitors; and very commonly fell upon them in true savage fashion, doing everything possible to exterminate each other, in order that the strongest and least scrupulous might survive.

We still see a lingering of this stage of business "civilization" but the present and growing-up generations of business men are realizing its futility and are demanding some way to abolish it altogether. But they are confronted with laws and a public opinion which are still focused on conceptions of that kind of business civilization. Consequently we find the very governments and their public officials who are exerting themselves to provide not merely employment, but employment at relatively high wages, for labor, at the same time using all their efforts and authority to prevent even fair profits for producers of construction materials.

Undoubtedly these men who now exercise huge concentrated purchasing power are convinced that they should take every advantage of producers that present conditions provide, believing that if the conditions were reversed they would be just as much the victims of the producers. In other words, they either don't know, or they don't believe, that sentiment in business (or the fundamentals of business theory and practice) has either changed or is changing. The sincerity of business men in their professions of the public service nature of business and industry is obviously challenged.

All this is unfortunate because to any reasoning man—in business, government or politics—it should be obvious that "buying power" must be restored to industry and business as well as to labor if we are to have normal business or economic conditions. The buying power of business and industry comes from the earnings of capital just exactly as the buying power of labor comes from the earnings of individuals. In the aggregate the buying power of business corporations undoubtedly exceeds the buying power of individuals; and the preservation of this buying power of industry is unquestionably vital to many subdivisions of industry and vital to stable economic conditions.

The buying power of industry comes from the margin between cost of production and sales price. It is a strange logic which makes a public benefit of the annihilation of this margin. Yet that is just what thousands of buyers of materials for public works are trying to accomplish at this moment. Probably most such public servants believe they are conscientiously protecting the public's welfare. What they need is education and understanding, not damnation and the threat of ultimate retaliation.

The conception of industry satisfied with fair but steady earnings, with sufficient individual self-control to gauge production to demand, and to forego cutting one another's throats, to resist the temptation to raise prices to the limit as soon as competitive pressure is removed, to consider service and quality above all other considerations—this conception of industry—is indeed so new even to industrialists themselves, that we can hardly condemn those in less intimate touch with business and industry for not accepting it all on faith.

We are inclined to think the burden of proof still rests with producers and industrialists; that they have still to prove that they will continue to cherish and promote such ideals of business in times of plenty as well as in times of famine, when mankind is apt to be pious. We ourselves believe sincerely that the great majority of business men have a changed attitude toward business—that they sincerely believe in the ultimate benefit of ethical and honorable practices in dealing with each other, and in dealing with their employes, stockholders, and the public. But with a considerable minority still practicing the jungle method of business competition, it is difficult to convince those not in close touch with industry that industry and business will eventually be civilized. With such a situation tolerance is needed both on the part of producers and on the part of public officials.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	3-11-31	94	.....	
Alpha P. C. new com.[2]	3- 7-31	17	18	50c qu. Jan. 24
Alpha P. C. pfd.[2]	3- 7-31	115	120	1.75 qu. Mar. 14
Amalgamated Phosphate Co. 6's 1936[19]	3- 6-31	99½	100½	
American Aggregates com.[43]	3-10-31	9	14	75c qu. Mar. 1
American Aggr. 6's w.w.[19]	3- 6-31	73	77	
American Aggr. 6's ex. w.[19]	3- 6-31	71	75	
American Brick Co., sand-lime brick	10- 6-30	4½	.....	25c qu. Feb. 1, '30
American Brick Co. pfd.	3- 9-31	57	.....	50c qu. May 1, '30
Am. L. & S. 1st 7's[27]	3-11-31	97	.....	
American SilicaCorp. 6½'s[39]	3-10-31	No market		
Arundel Corp. new com.	3- 9-31	40	40¼	75c qu. Jan. 2
Beaver P. C. 1st 7's[20]	3- 5-31	92	95	
Bessemer L. & C. Cl. A[4]	3- 6-31	31	.....	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'s[4]	3- 6-31	92	95	
Bloomington Limestone 6's[27]	3-11-31	52	54½	
Boston S. & G. new com.[37]	3- 6-31	14	17	40c qu. Jan. 2
Boston S. G. new 7% pfd.[37]	3- 6-31	43	47	87½c qu. Jan. 2
California Art Tile A	3- 5-31	2	5½	43¾c qu. Mar. 31
California Art Tile B[40]	3- 5-31	.....	5	20c qu. Mar. 31
Calaveras Cement com.	3- 5-31	5	12	
Calaveras Cement 7% pfd.	3- 5-31	.....	75	1.75 qu. Jan. 15
Canada Cement com.	3- 9-31	16⅜	17¾	
Canada Cement pfd.	3- 9-31	93⅞	94	1.62½ qu. Mar. 31
Canada Cement 5½'s[34]	3- 6-31	101¼	102	
Canada Cr. St. Corp. bonds[34]	3- 6-31	91	97	
Certainteed Prod. com.	3-10-31	3⅞	4	
Certainteed Prod. pfd.	3-10-31	13½	18	1.75 qu. Jan. 1
Cleveland Quarries	3- 9-31	.....	75	75c qu. 25c ex. Mar. 1
Columbia S. & G. pfd.	3- 9-31	97	99	
Consol. Cement 1st 6½'s, A	3-10-31	20	30	
Consol. Cement 6½% notes[27]	3-11-31	35	40	
Consol. Cement pfd.[27]	3-11-31	10	20	
Consol. Oka S. & G. 6½'s[12] (Canada)	3- 6-31	99	101	
Consol. Rock Prod. com.[9]	3- 5-31	75c	1	
Consol. Rock Prod. pfd.[9]	3- 5-31	3½	4	43¼c qu.June 1,'30
Consol. Rock Prod. units	3- 7-31	11	13	
Consol. S. & G. pfd. (Can.)	3- 9-31	75	79	1.75 qu. Feb. 16
Construction Mat. com.	3- 9-31	8½	9	
Construction Mat. pfd.	3- 9-31	26½	28	87½c qu. Feb. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[35]	3- 5-31	73	80	
Coosa P. C.1st 6's[27]	3-11-31	50	55	
Coplay Cem. Mfg. 1st 6's[33]	3- 6-31	95	.....	
Coplay Cem. Mfg. com.[33]	3- 6-31	10	.....	
Coplay Cem.Mfg. pfd.[33]	3- 6-31	60	.....	
Dolese & Shepard	3- 9-31	60	65	$2 qu. Jan. 2
Dufferin Pav. & Cr. Stone com.	3- 9-31	7½	11	
Dufferin Pav. & Cr. Stone pfd.	3- 9-31	76	78	1.75 qu. Jan. 2
Edison P. C. com.[22]	3- 6-31	50c	.....	
Edison P. C. pfd.[22]	3- 6-31	2	.....	
Federal P. C. 6½'s, 1941[19]	3- 6-31	96	100	
Giant P. C. com.[2]	3- 7-31	4	8	
Giant P. C. pfd.[2]	3- 7-31	23	30	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	3- 9-31	11	11⅛	20c qu. Jan. 2
Hermitage Cement com.[11]	3- 7-31	20	25	
Hermitage Cement pfd.[11]	3- 7-31	75	80	
Ideal Cement, new com.	3- 9-31	47	49	75c qu. Mar. 31
Ideal Cement 5's, 1943[29]	3- 7-31	99	100	
Indiana Limestone units[27]	3-11-31	.....	80	
Indiana Limestone 6's	3- 9-31	60	.....	
International Cem. com.	3- 9-31	57½	57¾	$1 qu. Mar. 31
International Cem. bonds 5's	3- 9-31	99½	99⅞	Semi-ann. int.
Iron City S. & G. bonds 6's[36]	11- 1-30	90	93	
Kelley Is. L. & T. new stock	3- 9-31	34	34½	62½c qu. Jan. 2
Ky. Cons. St. com. V. T. C.[38]	3- 7-31	5	10	
Ky. Cons. Stone 6½'s[38]	3- 7-31	85	90	
Ky. Cons. Stone com.[38]	3- 7-31	5	10	
Ky. Cons. Stone pfd.[38]	3- 7-31	75	85	$1.75 qu. Feb. 1
Ky. Rock Asphalt com.[11]	3- 7-31	5¼	6½	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.[11]	3- 7-31	75	85	1.75 qu. Mar. 1
Ky. Rock Asphalt 6½'s[11]	3- 7-31	85	93	
Lawrence P. C.[2]	3- 7-31	54	59	$1 qu. Dec. 29
Lawrence P. C. 5½'s, 1942[2]	3- 7-31	87	.....	
Lehigh P. C.	3- 9-31	16	18	25c qu. Feb. 2
Lehigh P. C. pfd.	3- 9-31	100	104	1.75 qu. Apr. 1
Louisville Cement[7]	3- 5-31	175	225	
Lyman-Richey 1st 6's, 1932[13]	3- 7-31	97½	99½	
Lyman-Richey 1st 6's, 1935[13]	3- 7-31	97	99	
Marblehead Lime 6's[14]	3- 6-31	No market		
Marbelite Corp. com. (cement products)	3- 5-31	25c	.....	
Marbelite Corp. pfd.	3- 5-31	2½	.....	50c qu. Oct. 10, 30
Material Service Corp.	3- 9-31	19	21½	50c qu. Mar. 1
McCrady-Rogers 7% pfd.[22]	3- 6-31	45	50	87½c qu. Dec. 31
McCrady-Rogers com.[22]	3- 6-31	15	20	75c Jan. 26
Medusa Portland Cement	3- 9-31	64½	65	1.50 Jan. 1
Michigan L. & C. com.[6]	3- 7-31	45	.....	
Missouri P. C.	3- 9-31	28¾	29	50c qu. Jan. 31
Monolith Portland Midwest[9]	3- 5-31	1¾	2½	
Monolith P. C. com.[9]	3- 5-31	3	4	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	3- 5-31	4	5	40c s.-a. Jan. 1
Monolith P. C. units[9]	3- 5-31	10	12	
National Cem. (Can.) 1st 7's[34]	3- 6-31	99½	101	
National Gypsum A com.	3- 9-31	4	4¾	
National Gypsum pfd.	3- 9-31	34	36	$1 Apr. 1
Nazareth Cement com.[25]	2-21-31	15	.....	
Nazareth Cement pfd.[25]	2-21-31	98	.....	
Newaygo P. C. 1st 6½'s[27]	3-11-31	101½	.....	
New Eng. Lime 1st 6's[14]	3- 6-31	No market		
N. Y. Trap Rock 1st 6's	3-10-31	98½ act. sale		
N. Y. Trap Rock 7% pfd.[30]	3- 7-31	95	.....	1.75 qu. Jan. 2
North Amer. Cem. 1st 6½'s	3- 9-31	51	.....	
North Amer. Cem. com.[41]	3- 6-31	1	2½	
North Amer. Cem.7% pfd.[41]	3- 6-31	15	19	
North Shore Mat. 1st 5's[15]	3-10-31	94	.....	
Northwestern States P. C.[31]	3- 9-31	105	.....	$2 Apr. 1
Ohio River Sand com.	3- 9-31	.....	14	
Ohio River Sand 7% pfd.	3- 9-31	.....	98	
Ohio River S. & G. 6's[16]	3- 6-31	88	93	
Oregon P. C. com.[20]	3- 5-31	5	13	
Oregon P. C. pfd.[20]	3- 5-31	87	95	
Oregon P. C. conv. pfd.	2-20-31	80	90	
Pacific CoastAggr. com.[40]	3- 5-31	3	.....	
Pacific Coast Aggregates pfd.	3- 7-31	2½	4	
Pacific Coast Cement 6's[5]	2-20-31	65¼	74¾	
Pacific P. C., new com.	3- 5-31	12	.....	
Pacific P. C., new pfd.	3- 5-31	71	75	1.62½ qu. Jan. 5
Pacific P. C. 6's[5]	3- 5-31	99¾	.....	
Peerless Cement com.[21]	3- 9-31	2½	4	
Peerless Cement pfd.[21]	3- 9-31	65	72	1.75 Jan. 1
Penn.-Dixie Cement com.	3- 9-31	Act. sale 4½		
Penn.-Dixie Cement pfd.	3- 9-31	21½	24	
Penn.-Dixie Cement 6's	3-11-31	73	.....	
Penn. Glass Sand Corp. 6's	3- 4-31	101	103	
Penn. Glass Sand Corp. pfd.	2- 4-31	90	.....	1.75 qu. Apr. 1
Petoskey P. C.	3- 9-31	6	7	15c qu. Apr. 1
Port Stockton Cem. com.[9]	3- 5-31	No market		
Riverside Cement com.	3- 5-31	10	12	
Riverside Cement pfd.[9]	3- 5-31	67½	70	1.50 qu. Feb. 1
Riverside Cement, A[20]	3- 5-31	10	12	15c qu. Feb. 1
Riverside Cement, B[20]	3- 5-31	1	2	
Roquemore Gravel 6½'s[17]	3- 7-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	3- 6-31	90	100	
Santa Cruz P. C. com.	3- 5-31	85	.....	$1 qu. Jan. 1 and $2 ex. Dec. 24
Schumacher Wallboard com.	3- 5-31	10	11	
Schumacher Wallboard pfd.	3- 5-31	18	23½	50c qu. Feb. 15
Southwestern P. C. units[35]	3- 5-31	240	.....	
Standard Paving & Mat. (Canada) com.	3- 9-31	15¼	15¾	50c qu. Feb. 16
Standard Paving & Mat. pfd.	3- 9-31	.....	76½	1.75 qu. Feb. 16
Superior P. C., A	3- 5-31	32⅝	37½	27½c mo. Apr. 1
Superior P. C., B	3- 5-31	9½	11½	25c qu. Dec. 20
Trinity P. C.units[31]	3- 9-31	120	.....	
Trinity P. C. com.[31]	3- 9-31	30	.....	
Trinity P. C. pfd.[27]	3-11-31	107	110	
U. S. Gypsum com.	3- 9-31	42	42½	40c qu. Mar. 31
U. S. Gypsum pfd.	3- 9-31	126	130	1.75 qu. Mar. 31
Wabash P. C.[21]	3- 9-31	17	22	
Warner Co. com.[16]	3- 6-31	31	33	50c qu. Apr. 15
Warner Co. 1st 7% pfd.[16]	3- 6-31	97	100	1.75 Apr. 1
Warner Co. 1st 6's	3- 9-31	Act. sale 95		
Whitehall Cem. Mfg. com.[30]	3- 7-31	80	.....	
Whitehall Cem. Mfg. pfd.[30]	3- 7-31	50	.....	
Wisconsin L. & C. 1st 6's[15]	3-10-31	94	.....	
Wolverine P. C. com.	3- 9-31	.....	3¾	15c qu. Nov. 15
Yosemite P. C., A com.[9]	3- 5-31	2	2½	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Co., San Francisco, Calif. [6]Frederic H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]A. B. Leach & Co., Inc., Chicago, Ill. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher & Co., Denver, Colo. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]Hemphill, Noyes & Co., New York City. [42]Nesbitt, Thomas & Co., Montreal. [43]Foreman State-National Bank, Chicago.

Missouri Portland Cement Co. Statement

THE annual financial statement of the Missouri Portland Cement Co., St. Louis, is reported as follows (for the year ended December 31):

INCOME ACCOUNT OF MISSOURI PORTLAND CEMENT CO.

	1930	1929
Net profits	$1,651,888	$1,422,856
Depreciation	434,107	422,742
Depletion	11,948	12,592
Net earnings	1,205,833	987,522
Dividends	748,210	748,210
Balance	$457,623	$239,312
Earned per share	$4.03	$3.30

Number of shares, 299,284.

BALANCE SHEET AS OF DECEMBER 31

ASSETS

	1930	1929
*Real estate, plant, etc.	$7,300,905	$6,942,308
Good-will, etc.	1	1
Current assets:		
Cash	313,294	273,348
Bank certificates of deposit	1,275,000	1,250,000
Notes and accounts receivable	115,067	147,978
Demand loan (secured)	55,000	.....
Accrued income	13,578	12,520
Inventory	941,806	1,100,083
Investment in subsidiary	2,421,840	2,421,840
Other investments	135,250	135,250
Sundry accounts	215,458	96,618
Deferred charges	63,860	49,118
Total	$12,851,059	$12,429,064

LIABILITIES

Capital stock	$7,482,100	$7,482,100
Current liabilities:		
Accounts payable	42,336	95,589
Accrued accounts	6,035	3,506
Reserve for taxes	145,000	110,000
Reserve for sack redemption	75,712	75,615
Other reserves	107,500	127,500
Appropriated surplus	1,500,000	1,500,000
Unappropriated surplus	3,492,377	3,034,754
Total	$12,851,059	$12,429,064
Current assets	$2,713,745	$2,783,929
Current liabilities	193,371	209,094
Working capital	$2,520,374	$2,574,835

*After depreciation and depletion.

Receiver Appointed for New Jersey Gravel Concern

VICE CHANCELLOR BERRY on February 24 appointed Sylvester C. Smith receiver for the Eastern States Sand and Gravel Corp. of Hackettstown, N. J. Application for the receiver had been made by Samuel I. Kessler on behalf of William G. Kendall of 575 Prospect street, Maplewood, owner of 9000 shares of common stock.

Mr. Kendall charged "gross mismanagement" by its officers resulted in the concern becoming insolvent in January, 1924. He charged officers and directors at that time, with knowledge that the company was insolvent, conspired to issue $60,000 worth of 6% bonds secured by a mortgage.

It was charged that John Doscher, holder of 3600 shares of stock in the company, had with his family received $26,000 of these bonds, while $13,300 of them had gone to Henry D. Bahr, president of the company, and F. J. Rawlings, a director. Others made defendant in the suit were Bernard G. Portman, treasurer, and Frederick W. Matthiesen, secretary. Mr. Kendall stated Mr. Doscher had started foreclosure on the $60,000 mortgage last December.

No opposition was made to appointment of the receiver.—*Newark* (N. J.) *News.*

Alpha Portland Cement Co.'s Annual Report

CONDENSED SUMMARY OF INCOME AND SURPLUS OF THE ALPHA PORTLAND CEMENT CO.

	Year ended December 31, 1930	1929
Net sales	$9,936,820.79	$11,368,968.71
Operating expenses*	8,704,310.35	9,636,247.64
Profit from operations	$1,232,510.44	$1,732,721.07
Miscellaneous income, net	185,842.60	307,297.07
Net income for the year before provision for federal income tax	$1,418,353.04	$2,040,018.14
Provision for federal income tax (est.)	170,000.00	225,000.00
Net income for the year	$1,248,353.04	$1,815,018.14
Surplus at beginning of the year	4,715,486.89	5,173,468.75
Gross surplus	$5,963,839.93	$6,988,486.89
Profit and loss charges:		
Dividends:		
On preferred capital stock	$140,000.00	$140,000.00
On common capital stock	1,599,750.00	2,133,000.00
Additional depreciation for the year 1928 as adjusted by the Treasury Department	32,365.94	.....
Provision for additional income taxes —Prior years	200,000.00	.....
Adjustment of sack inventory to market value at December 31, 1930	95,657.87	.....
Total	$2,067,773.81	$2,273,000.00
Surplus at end of the year	$3,896,066.12	$4,715,486.89
*Including:		
Depreciation and depletion	$1,390,311.69	$1,369,983.96
Maintenance and repairs	890,376.65	1,203,141.35

EARNINGS of the Alpha Portland Cement Co. were less in 1930 than the previous year due largely to a reduction in shipments and to the low prices originating in 1929 controlling a large portion of the business in 1930, according to the recent annual report of G. S. Brown, president of the company. The consumption of cement in the United States was considerably less than in previous years owing to existing business conditions.

Reducton in Dividend Rate

Under existing conditions the board of directors felt that a reduction in the dividend rate was necessary, and also that every effort should be made to conserve the assets of the company. As a result of this policy production has been carefully controlled, as well as inventories, and the cash position of the company at the end of the year is the best in its history.

Surplus adjustments were made amounting to $328,023.81. This represents three items. There was set up as a contingent liability the sum of $200,000 as additional reserve for federal income and excess profits taxes, representing possible liability on a disputed claim of the United States government assessed against corporations whose properties were acquired in 1920. The ultimate liability on this amount is now before the federal courts for adjudication. A charge of $95,657.87 was made as an adjustment in the inventory of cotton sacks. While these cotton sacks are not strictly a

CONDENSED CONSOLIDATED BALANCE SHEET OF THE ALPHA PORTLAND CEMENT CO.

(December 31, 1930 and 1929)

ASSETS

	1930—December 31—1929	
Current assets:		
Cash	$5,372,271.96	$2,914,834.82
Certificates of deposit	125,000.00	.....
Call loans	.....	2,600,000.00
United States Liberty Loan Bonds, Treasury Certificates, municipal tax warrants, etc. (at cost)	1,861,200.44	1,357,975.44
Working funds, advances, etc.	131,897.68	217,987.52
Accounts and notes receivable, less reserves for discounts, freight and doubtful accounts	377,791.48	399,149.95
Inventories: Finished cement, clinker, sacks, materials and supplies (based on physical inventories and lower of cost or market)	2,273,704.84	2,895,379.76
Total current assets	$10,141,866.40	$10,385,327.49
Miscellaneous investments (at cost)	$289,823.78	$273,039.17
Property:		
Land, buildings, machinery, equipment, and coal mine lease	$33,642,490.56	$33,058,658.30
Less reserves for depreciation, depletion, etc.	12,548,264.56	11,125,664.35
Net property	$21,094,226.00	$21,932,993.95
Deferred items	158,296.01	138,317.32
Total	$31,684,212.19	$32,729,677.93

LIABILITIES

	1930—December 31—1929	
Current liabilities:		
Accounts payable	$163,225.43	$328,950.50
Wages payable	17,159.32	35,460.45
Federal income and general taxes—Current year (estimated)	210,479.15	268,060.80
Dividend payable	355,500.00	533,250.00
Total current liabilities	$746,363.90	$1,165,721.75
Reserves:		
Compensation and other insurance	$601,287.77	$599,730.77
Miscellaneous	305,994.40	114,238.52
Total reserves	$907,282.17	$713,969.29
Capital stock:		
Preferred 7% cumulative (authorized and outstanding, 20,000 shares of $100 each)	$2,000,000.00	$2,000,000.00
Common: Without par value (authorized, 1,000,000 sh.; issued and outstanding, 711,000 sh.)	24,134,500.00	24,134,500.00
Total capital stock	$26,134,500.00	$26,134,500.00
Surplus	$3,896,066.12	$4,715,486.89
Total	$31,684,212.19	$32,729,677.93

part of merchandise inventories, because of their relatively short life and of the decline in the market cost of new sacks, a reserve has been set up to reduce the book value of cotton sacks to the present market therefor. An item of $32,365.94 has been set up as additional depreciation in prior years representing amounts allowed by the federal government in the determination of federal income taxes for those years, which was in excess of the depreciation heretofore charged against income.

The plants and properties of the company have been well maintained and new construction authorized in 1929 was completed. At the Jamesville, N. Y., plant a 100,000-bbl. cement silo storage and packing house, to further improve the service to customers, was finished. New 60-cycle motors of the latest design and a unit coal mill were insalled throughout this plant. At the Martin's Creek No. 4 plant a 10,000-kw. Westinghouse turbo-generator was placed in service.

The company reports a year of operation without a fatal accident at any of its plants and seven of the ten plants completed the year without a lost-time accident. Only two of the plants have not won the Portland Cement Association safety trophy. The Ironton plant on December 9, 1930, completed its fourth year of no-accident operation—a remarkable record only surpassed by one other cement plant in the United States.

Manufacturing costs have been reduced in spite of the tonnage being approximately 20% less than the previous year. The quality of the product continues to improve and will successfully meet the new and higher specifications for portland cement, adopted in 1930.

The duty of 23c per bbl. on cement imported into the United States included in the Hawley-Smoot tariff bill, passed by the United States Congress in 1930, has afforded some measure of protection to the industry, but is insufficient to permit United States cement manufacturers to market their product at a profit at seaboard points in competition with foreign cement.

Annual Report of the United States Gypsum Co.

THE NET INCOME of the United States Gypsum Co. and its subsidiaries for the year ended December 31, 1930, is $5,408,685.47, after deducting depreciation, depletion and federal income taxes, an increase of $306,380.55 over the net income for the year 1929. This net income, after providing for the 7% dividend on the preferred stock, is equal to $4.01 per share on the common stock now outstanding, and represents an earning of $4.15 per share on the average number of shares of common stock outstanding during the year.

Cash dividends of $3,013,653.90 were paid. The net amount added to earned surplus was $2,395,031.57. The paid-in surplus was increased by $1,534,015.50 as a result of the issuance of stock for the purchase of property and other uses, at prices higher than its par value.

Plant additions for the year amounted to $4,433,018.66. Of this sum $2,989,328.92 was for the acquisition of new properties for which capital stock of the company was issued in the amount of $2,672,458.91 and $316,870.01 paid in cash. Expenditures for improvements and additions to existing plants were $1,443,689.74.

During the year the company actively entered the metal lath field through the acquisition of two metal lath companies with three producing units; also the insulating board field through the purchase of an in-

CONSOLIDATED BALANCE SHEET OF THE UNITED STATES GYPSUM CO. AS OF DECEMBER 31, 1930

ASSETS

Current assets:		
Cash and cash resources—		
Bank balances and working funds		$ 728,662.16
Marketable securities, including accrued interest—at cost—U. S. government securities	$7,519,172.11	
Municipal bonds	1,020,099.91	
		8,539,272.02
		$ 9,267,934.18
Receivables—		
Accounts and notes	$3,798,137.88	
Construction contracts	271,852.96	
		$ 4,069,990.84
Less—Reserves for bad debts		3,645,530.40
Inventories of finished goods, raw materials, supplies, etc., as taken by the company, priced at cost which is not in excess of market		4,313,514.84
		$17,226,979.42
Stock subscriptions receivable, investments, etc.:		
Employes' stock purchase contracts	$ 1,722,273.39	
Bonds on deposit for insurance reserve, including interest—at cost	181,202.35	
Miscellaneous stocks and bonds—at book value	73,379.20	
		1,976,854.94
Plant and equipment—at book value:		
Land, gypsum, buildings, machinery, steamers, etc.	$60,717,549.24	
Less—Reserves for depreciation and depletion	10,991,003.54	
		49,726,545.70
Deferred charges:		
Stripping costs, amortizable patent expenditures and prepaid expenses		937,442.18
		$69,867,822.24

LIABILITIES

Current liabilities:		
Accounts payable		$ 601,742.26
Accrued liabilities—		
Payrolls, local taxes, etc.	$476,159.36	
Federal income taxes	685,671.39	
		1,161,830.75
		$ 1,763,573.01
Reserves:		
Contingencies	$903,012.32	
Accident insurance, guarantees, etc.	493,765.42	
		1,396,777.74
Capital stock and surplus:		
7% cumulative preferred stock—$100 par value—		
Authorized—100,000 shares.		
Issued and outstanding—		
78,417 shares (87,277 shares issued less 8860 shares in treasury)		$ 7,841,700.00
Common stock—$20 per value—		
Authorized—3,000,000 shares.		
Issued and outstanding—		
1,212,598 shares (1,221,821 shares issued less 9223 shares in treasury)		24,251,960.00
Surplus—		
Paid-in surplus	$ 6,378,248.14	
Earned surplus	28,235,563.35	
		34,613,811.49
		66,707,471.49
		$69,867,822.24

CONSOLIDATED PROFIT AND LOSS ACCOUNT OF THE UNITED STATES GYPSUM CO. FOR THE YEARS ENDED DECEMBER 31, 1929 AND 1930

	1930	1929
Net profits on operation before provisions for depreciation, depletion and income taxes	$7,835,520.06	$6,956,427.07
Other profits and income	683,132.89	925,043.81
Total	$8,518,652.90	$7,881,470.88
Deductions from income	259,863.15	465,851.27
Net profits from all sources before provisions for depreciation, depletion and income taxes	$8,258,789.80	$7,415,619.61
Deduct—Provisions for—		
Depreciation and depletion	$2,163,030.62	$1,766,082.31
Income taxes	687,073.71	547,232.38
Total	$2,850,104.33	$2,313,314.69
Surplus net profits for year (1929 includes prior year's tax credit)	$5,408,685.47	$5,102,304.92

SUMMARY OF CONSOLIDATED SURPLUS ACCOUNTS OF THE UNITED STATES GYPSUM CO. FOR THE YEARS ENDED DECEMBER 31, 1929 AND 1930

	1930	1929
Paid-in surplus:		
Balance at beginning of year (segregated from combined surplus)	$ 4,844,232.64	$ 4,550,931.94
Surplus credits resulting from issuance of stock	1,534,015.50	293,300.70
Balance at end of year	$ 6,378,248.14	$ 4,844,232.64
Earned surplus:		
Balance at beginning of year—		
Paid-in and earned surplus combined	$30,684,764.42	$27,193,273.70
Deduct—Amount segregated as paid-in surplus	4,844,232.64	4,550,931.94
Net	$25,840,531.78	$22,642,341.76
Add—Surplus net profits for year	5,408,685.47	5,102,304.92
Total	$31,249,217.25	$27,744,646.68
Deduct—Cash dividends—		
On preferred stock	$ 543,669.00	$ 528,089.91
On common stock	2,469,984.90	1,376,024.99
Total	$ 3,013,653.90	$ 1,904,114.90
Balance at end of year	$28,235,563.35	$25,840,531.78

COMPARATIVE CONSOLIDATED BALANCE SHEETS OF THE UNITED STATES GYPSUM CO., 1925-1930

ASSETS

	1930	1929	1928	1927	1926	1925
Current assets:						
Cash on hand and in banks	$ 728,662.16	$ 715,193.01	$ 1,491,516.49	$ 1,333,346.10	$ 1,123,703.51	$ 899,270.20
U. S. government securities	7,519,172.11	5,433,219.62	7,497,095.55	6,100,350.37	5,647,006.23	6,515,129.25
Municipal bonds	1,020,099.91					
Accounts and notes receivable	3,798,137.88	3,821,161.70	3,756,719.06	4,423,100.65	4,567,001.45	4,628,331.46
Construction contracts receivable	271,852.96	643,822.49	749,168.68	498,544.91	838,053.60	680,457.68
Inventories	4,313,514.84	4,051,556.84	3,084,988.03	3,431,907.45	3,754,122.74	3,319,318.56
Total	$17,651,439.86	$14,664,953.66	$16,579,487.81	$15,787,249.48	$15,929,887.53	$16,042,507.15
Stock subscriptions receivable, investments, etc.:						
Stock purchase contracts	$ 1,722,273.39	$ 1,393,977.48	$ 6,411,394.86			
Bonds and other securities	254,581.55	209,646.07	196,697.74	160,032.66	127,814.58	119,118.50
Total	$ 1,976,854.94	$ 1,603,623.55	$ 6,608,092.60	$ 160,032.66	$ 127,814.58	$ 119,118.50
Plant and equipment	$60,717,549.24	$56,632,037.38	$46,022,197.51	$39,969,762.25	$34,371,206.52	$28,247,659.71
Deferred charges	$ 937,442.18	$ 856,675.49	$ 750,571.11	$ 639,366.51	$ 463,956.21	$ 238,682.28
Total assets	$81,283,286.22	$73,757,290.08	$69,960,349.03	$56,556,410.90	$50,892,864.84	$44,647,967.64

LIABILITIES

Current liabilities:						
Accounts payable	$ 601,742.26	$ 644,090.46	$ 1,139,715.56	$ 924,426.23	$ 1,210,554.53	$ 1,183,038.52
Accrued liabilities	1,161,830.75	1,090,355.95	1,817,443.98	1,714,815.39	1,858,182.95	1,697,991.93
Total	$ 1,763,573.01	$ 1,734,446.41	$ 2,957,159.54	$ 2,639,241.62	$ 3,068,737.48	$ 2,881,030.45
Reserves (including depreciation and depletion)	$12,812,241.72	$10,810,579.25	$ 9,157,395.79	$ 7,718,390.25	$ 6,820,045.74	$ 6,097,065.82
Net worth:						
Preferred stock	$ 7,841,700.00	$ 7,541,700.00	$ 7,841,700.00	$ 8,141,600.00	$ 8,441,600.00	$ 8,741,600.00
Common stock outstanding	24,251,960.00	22,985,800.00	15,208,720.00	13,823,960.00	13,757,500.00	10,138,300.00
Common stock subscribed			7,602,100.00			
Surplus	34,613,811.49	30,684,764.42	27,193,273.70	24,233,219.03	18,804,981.62	16,789,971.37
Total	$66,707,471.49	$61,212,264.42	$57,845,793.70	$46,198,779.03	$41,004,081.62	$35,669,871.37
Total liabilities and net worth	$81,283,286.22	$73,757,290.08	$69,960,349.03	$56,556,410.90	$50,892,864.84	$44,647,967.64
Net working capital	$15,887,866.85	$12,930,507.25	$13,622,328.27	$13,148,007.86	$12,861,150.05	$13,161,476.70

sulating board plant; and augmented its lime opportunity by entry into the high calcium lime field by acquiring two lime plants. It also materially strengthened its position in Canada by the purchase of a long established gypsum business and property. The company further widened its list of products through the sale of colored sheet tile, pulp board and mortar colors.

The serious decline in building for the year which curtailed the demand for all commodities at all mills was met by low manufacturing and distributing costs, a wider line of products, improved market conditions and a substantial contribution to earnings from the new mills completed during the previous year.

Although the immediate outlook for an improvement in building is not encouraging and a slow recovery is indicated, the position of the company as to properties, products, distributive facilities and organization, justifies the expectation of a reasonably satisfactory year for 1931.

The United States Gypsum Co., with general offices in Chicago, Ill., now has branch offices in the following cities:

New York	Milwaukee
Buffalo	Minneapolis
Boston	St. Louis
Washington	Kansas City
Baltimore	Omaha
Philadelphia	Dallas
Pittsburgh	Denver
Cleveland	Atlanta
Cincinnati	Memphis
Indianapolis	Los Angeles
Detroit	San Francisco
Montreal	Toronto

The following are subsidiary companies: Canadian Gypsum Co., Ltd., United States Gypsum Co. of Delaware, United States Gypsum Co. of Maryland, Samson Plaster Board Co., United States Gypsum Transportation Co., Gypsum Packet Co., Ltd., The Gypsum Co., Dominion Gypsum Co., Ltd., Weatherwood Co.

Annual Report of the Lawrence Portland Cement Co.

THE PLANTS of Lawrence Portland Cement Co., according to the annual report of its president Frank H. Smith, while not operating at full capacity during the year 1930, on account of general business conditions of the country, were nevertheless able to produce cement and lime at a cost below the previous year. This together with a higher price realized for the products resulted in a larger income than in 1929.

Practically no benefits were derived from the Hawley-Smoot tariff bill, which provided a duty on cement of 6c per 100 lb. or 23c per bbl.; it does not enable domestic cement manufacturers to sell at a profit in competition with foreign cement for delivery at seaboard points.

Both plants are in splendid physical condition and for that reason the expenditures for betterments and improvements have been minimized.

To date the company has purchased $209,000 par value of outstanding debenture bonds to be cancelled according to the terms of the sinking fund. During the year bonds required by the sinking fund agreement of $150,000 par value were turned over to the trustee and cancelled. The balance of $59,000 par value is in the treasury to be held until the next sinking fund due date. Bonds amounting to $1,791,000 par value were outstanding as of December 31, 1930.

The funded debt of the company was further reduced during the year by the payment of one $60,000 serial note due November 18, 1930.

The investment in the Calcite Quarry Corp. was increased by the purchase of 70 shares of Class A stock in accordance with an agreement with that company.

In paying dividends of $4 per share during the year, in the aggregate $300,000, the directors felt it to be to the best interests of the stockholders to conserve the company's cash resources.

Improvements Completed at Both Plants

The principal improvements at the Northampton, Penn., plant include the following: four Bailey coal feeders for use in connection with kilns No. 9, 10, 11 and 12; a Richardson "Convey-O Weight" to determine the output of No. 12 kiln; three automobiles for use at the mill replacing old cars. At the Thomaston, Me., plant: a Marion electric shovel No. 490; a tripod drill for quarry use was purchased; the Thew gasoline shovel was changed to electric drive; a 1000-gal. tank for the storage of gasoline was installed; two 50-ton second-hand railroad cars were purchased and a Hall cylinder hone for use in the machine shop. A Ford coupe for mill use was purchased. A dust collection system in the gypsum mixing plant was installed; coverings for the piping and dust collectors connected with the coal mill were provided; the installation of a dust collector in the coal dryer department; a wall was built between the filter floor and the kiln room.

The contract with the Pennsylvania Power and Light Co. for electric energy expired December 31, 1930 and negotiations are now under way for the execution of a new contract in case it is decided not to build the waste-heat plant mentioned in previous reports. The Northampton plant will therefore operate on the new schedule which went into effect January 1 until some definite conclusions are reached.

A substantial reduction on fire insurance rates was promulgated by the Factory Mu-

tual Insurance Cos. effective at both Thomaston and Northampton plants during the year.

The welfare and safety departments have made a very favorable showing during the year, the lost-time accidents at both plants being reduced to six.

The operation of the lime plant at Thomaston showed improvement over last year, but unfortunately, on account of the smaller demand, the plant was not able to produce at its full capacity.

There were no special changes made in "Hy-Test" masons' cement department.

CEMENT AND LIME MANUFACTURED, PURCHASED AND SOLD IN 1930 BY THE LAWRENCE PORTLAND CEMENT CO.

	Manufactured	Purchased	Sold
"Dragon" portland (bbl.)	2,751,474	132	2,595,359
"Dragon Super" (bbl.)	24,883	.....	30,134
"Hy-Test" (bbl.)	426,680	.....	425,545
"Strongfast" (bbl.)	11,145	.....	None
Lime (net tons)	15,234	.....	14,923

CONDENSED STATEMENT OF INCOME OF THE LAWRENCE PORTLAND CEMENT CO. FOR THE YEAR ENDED DECEMBER 31, 1930

Income from sales of cement and lime		$1,167,702.52
Other income		87,791.14
		$1,255,493.66
Provision for depreciation, interest, bond discount amortization, bad debts and federal taxes		492,191.66
Net income carried to surplus account ($10.18 per share)		$ 763,302.00

CONDENSED BALANCE SHEET OF THE LAWRENCE PORTLAND CEMENT CO. AS AT DECEMBER 31, 1930

ASSETS

Land, buildings, plant, and equipment	$11,620,512.53	
Deduct: Amount reserved for depreciation	2,593,186.57	
		$ 9,027,325.96
Current assets:		
Cash and accounts receivable (less reserve for doubtful accounts)	$ 841,013.40	
Cement, materials and supplies on hand (cost)	1,500,171.72	
		2,341,185.12
Investment assets		228,300.00
Deferred charges (including unamortized bond discount)		89,605.65
		$11,686,416.73

LIABILITIES

Current liabilities (accounts payable), (excess of current assets over current liabilities $2,061,886.86)		$ 279,298.26
Funded debt:		
Fifteen year 5½% gold debenture sinking fund bonds, due April 1, 1942	$ 1,791,000.00	
Notes payable, due serially beginning November 18, 1931	180,000.00	
		1,971,000.00
Capital stock, issued and outstanding		7,500,000.00
Surplus (after deducting estimated federal taxes)		1,936,118.47
		$11,686,416.73

Recent Dividends Announced

Ideal Cement com. (qu.)	$0.75	Mar. 31
International Cement com. (qu.)	1.00	Mar. 31
National Gypsum 7% pfd.	1.00	Apr. 1
Penn. Glass Sand pfd. (qu.)	1.75	Apr. 1
Superior P. C. Cl. A (mo.)	0.27½	Apr. 1

General Aggregates Corp. Offers Bonds

THE GENERAL AGGREGATES CORP., Memphis, Tenn., recently formed as a merger of the Central Sand and Gravel Co., Memphis; the Greenville Sand and Gravel Co., Greenville, Miss., south of Memphis; the Cedar Bluff Quarry, Princeton, Ky.; the Cerulian Stone Co., Cerulian, Ky.; the Ohio River Sand and Gravel Co., Paducah, Ky.; and the Camden Gravel Co., Camden, Tenn., all north of Memphis, is offering $1,500,000 in first mortage and leasehold 10-year, 6½% sinking fund gold bonds, due March 15, 1941.

These bonds are being placed on market by E. W. Hays & Co., Louisville, Ky., and Memphis, Tenn., at 98½ and interest, to yield 6.65%.

The following is from a prospectus issued by E. W. Hays & Co.:

Business and Territory

The General Aggregates Corp. has been organized under the laws of Delaware to acquire in fee simple the physical properties of six companies engaged in the production and sale of crushed stone, sand, gravel, riprap and limestone in the states of Arkansas, Kentucky, Tennessee and Mississippi. The companies produce crushed stone and gravel for ballast for important railroads in this section of the country, together with other railroad material and concrete aggregate. Included among present customers are the Illinois Central R. R., the Frisco Lines, the Missouri Pacific R. R., the Southern Railway Co., the Yazoo & Mississippi Valley R. R. Co., the Louisville & Nashville R. R. Co., the Nashville, Chattanooga & St. Louis Railway, the United States Government and the Highway Departments of Kentucky, Tennessee, Mississippi and Arkansas. It is interesting to note that official highway figures for the Southern states for the year 1931 call for an expenditure of $600,000,000.

The corporation has entered into a sales agreement with the Fischer Lime and Cement Co. of Memphis, Tenn., the largest organization of its kind in the lower Mississippi Valley, under which the latter company has the exclusive distribution in certain territories for its products, except sales to railroads and the U. S. Government. It is estimated that this agreement will utilize a substantial amount of the maximum production of the corporation thus eliminating a large portion of sales costs.

These companies produced in 1930 approximately 1,300,000 tons of crushed rock, sand and gravel. It is estimated that this production in 1931 will be approximately 1,500,000 tons. The present combined capacity of the plants is well in excess of 2,250,000 tons. Based on figures obtained from the United States Geological Survey made in the territories served by the various companies, it is estimated that these companies produced in 1930 approximately 90% of the crushed rock and about 95% of the sand and gravel used in their immediate territory for commercial purposes.

The location of the plants with respect to railroads, highways and other users of crushed stone and gravel is such that they can supply the needs of these consumers with either short railroad hauls or by river transportation. The plants are located in a territory where it is probable the greatest amount of railroad and highway building and flood control work will take place in the immediate future. The various plants are so advantageously located and their land and marine equipment of such character that they can supply the major ballast requirements of the most important railroads traversing the various states which they serve. The corporation's territory extends from Louisville, Ky., on the north, to Vicksburg, Miss., on the south.

Richard K. Meade & Co., nationally known chemical and industrial engineers, and consultants for quarry and cement companies, who have made a recent survey of the properties, state that the stone and gravel resources owned by the plants to be acquired are practically unlimited.

Capitalization

The capitalization of the corporation upon completion of the present financing program will be as follows:

	Authorized	Outst'ding
First mortgage and leasehold 6½% sinking fund gold bonds, Series "A," due March 15, 1941	(*)	$1,500,000
Convertible 6½% debentures, due March 15, 1941 (closed)	$750,000	$750,000
Common stock, no par value, shares	†250,000	75,000

*Additional bonds may be issued subject to restrictions set out in the trust indenture for a principal amount not to exceed 66⅔% of the cost or value (whichever is lower) of additional property acquired, but not unless earnings for the preceding 12 months shall have been at least three times interest charges.

†45,000 shares reserved for the exercise of warrants accompanying outstanding first mortgage bonds and 75,000 shares are reserved for conversion of debenture bonds.

Security

These bonds will be a direct obligation of the General Aggregates Corp. and will be secured, in the opinion of counsel, by a direct first mortgage on the principal physical properties now being acquired and by a first mortgage leasehold on certain minor properties and trackage rights. Richard K. Meade & Co., chemical and industrial engineers, have recently appraised these properties at a fair value of $4,906,823, or 3.5 times the amount of this issue.

Earnings

Earnings of the constituent properties to be acquired and operated for the year ended August 31, 1930, available for interest, depreciation, depletion and federal taxes, have been certified by Ernst & Ernst, accountants and auditors, at $318,518.08, or equivalent to 3.26 times maximum annual interest requirements on this issue of bonds. Similarly stated for the year ended August 31, 1930, but adjusted to give effect to prices for material from three of the constituent plants under sales agreements now in effect, were $375,108, or 3.84 times such maximum annual bond interest requirements. Similarly stated earnings for the year ended August 31, 1929, were $367,053, or 3.77 times maximum interest requirements on this issue. Nonrecurring charges amounting to $39,691.42 in the year ended August 31, 1929, and $49,538.25 in the year ended August 31, 1930, and reflecting economies due to be effected by the consolidation have been certified to by Ernst & Ernst and are included in the above figures.

Purpose of the Issue

The proceeds from the sale of this issue of first mortgage and leasehold bonds together with the proceeds from other financing will be used by the corporation for the acquisition of the properties, plants and equipment of the companies entering into

this consolidation, for working capital and for other corporate purposes.

Stock Purchase Warrants

A detachable stock purchase warrant will be attached to each $1,000 bond of this issue, smaller denominations in proportion, entitling the holder to purchase at his option at any time on or before March 15, 1941, at the price of $10 per share, 30 shares of the fully paid and non-assessable common stock of the company without par value. The indenture will contain provisions designed to protect the stock purchase warrants against any issuance of common stock over the present authorized total. The board of directors of the corporation has agreed to declare immediately a quarterly dividend of 25c per share which is equivalent to an annual dividend of $1 per share upon the outstanding common stock of the company beginning July 15, 1931.

Management

The executive officers of the corporation will be W. W. Fischer, chairman of the board; A. J. Hoffman, president; L. T. McCourt, vice-president; and W. C. Sparks and W. E. McCourt, divisional managers. These men, without exception, have had a long and successful experience in aggregate industries and all are familiar with the business of the companies forming this consolidation.

Mr. Fischer is president of the Fischer Lime and Cement Co., which is one of the largest building supply companies in the United States and the largest south of St. Louis, with headquarters in Memphis, Tenn., where it has large offices, warehouses, storage bins and treating plants. This company has a trained and highly developed sales organization which, in addition to a large volume of business outside of the city, sells over 90% of the gravel and 60% of the sand used in Memphis. Mr. Fischer is one of the more prominent business men in this section of the south and has wide connections, political, financial and industrial, which will be of material benefit to the corporation.

A. J. Hoffman was the founder of the Kentucky Consolidated Stone Co. He is a director in that organization and numerous other concerns affiliated with the aggregates industry, and has had a long practical experience in the business.

L. T. McCourt has been in actual charge of four of the plants included in this consolidation. Under his management these properties have shown substantial and increasing earnings and his knowledge of competitive conditions and his familiarity with the territory and his wide connections in the section will be of very material assistance to the corporation.

Together, this group supplies the essential factors of proven ability in the business, familiarity with the operations of the constituent properties and with conditions in the territory and connections, political and otherwise, throughout the section which make for successful management and profitable operation.

Sinking Fund

The indenture provides for a semi-annual sinking fund based on earnings for the preceding six months' period ending September 15 and March 15, respectively, beginning September 15, 1932. The amount will be calculated at the rate of 20% of the net earnings of the corporation after payment of interest charges and federal taxes, but before depreciation, depletion and dividends. The proceeds of the semi-annual sinking fund will be paid to the trustee within 30 days from close of period—a provision of the indenture authorizes the trustee to use these funds for the purchase and retirement of bonds in the open market or to call by lot at 105.

Additional Sinking Fund

All funds to be derived from the exercising of warrants attached to the bonds of the corporation will be deposited with the trustee for the purchase and retirement of bonds in the open market or callable by lot at 105.

Contract

The General Aggregates Corp. has entered into a contract with the Fischer Lime and Cement Co., Memphis, Tenn., for a period of ten years. The contract provides that the Fischer Lime and Cement Co. will have the exclusive sales rights in Memphis and Shelby county, Tenn., and it will purchase all its requirements to meet its needs and/or to supply its trade from the General Aggregates Corp., with the exception of two special types of aggregates not produced by the corporation. Also, the Fischer Lime and Cement Co. has the right and privilege of selling for the account of the General Aggregates Corp. outside of Memphis and Shelby county, within the territory served by the plants of General Aggregates Corp. However, this shall not be exclusive. The terms and provisions of this contract do not apply to sales of ballast to railroad companies or to sale of materials to the United States government f.o.b. barges. Furthermore, this contract is favorable as to prices for both parties and is considered a most advantageous factor.

Future

The business of the corporation is basic and the product an absolute essential. Few lines of industry are so fortified against depressions. The large appropriations of the Federal Government totaling over $300,000,000 for flood control work, together with harbor and river funds totaling $200,000,000, indicate public interest in construction work at this time. Highway bonds, gasoline tax and automobile license fee insure ample funds for the building of roads in the territory served by the plants of this corporation. The company has unfilled orders for over 900,000 tons on hand, and earnings for 1931 are conservatively estimated at $450,000. The supplying of aggregates has assumed all the aspects of a public utility and this industry has reported an almost uninterrupted growth.

The corporation agrees to make application to list these bonds on the Chicago Stock Exchange.

PRO-FORMA BALANCE SHEET OF THE GENERAL AGGREGATES CORP.

ASSETS

Cash	$125,000	
Inventory (certified by management) sand and gravel	37,900	$162,900
Permanent (appraised by Richard K. Meade & Co., as of November 1, 1930, at $4,906,823)		
Real estate	$86,250	
Buildings and equipment	1,160,117	
Gravel and stone deposits, including leaseholds	2,433,750	3,680,117
Deferred		
Supplies inventory (certified by management)		37,500
		$3,880,517

LIABILITIES

Accounts payable		
For organization expenses		$25,000
Funded debt		
Ten-year 6½% convertible debentures due March 15, 1941	$750,000	
Ten-year first mortgage and leasehold 6½% sinking fund gold bonds, Series "A," due March 15, 1941	1,500,000	2,250,000
Nominal		
Common stock—no par value		
Authorized, 250,000 shs.		
Issued, 75,000 shares.		
Stated capital	$1,125,000	
Capital surplus	480,517	1,605,517
		$3,880,517

EARNINGS

	1929	1930	1931*
Net operating profit	$367,000	$375,000	$450,000
Interest first mortgage 6½% bonds	97,500	97,500	97,500
	$269,500	$277,500	$352,500
Interest—Debenture 6½% bonds	48,750	48,750	48,750
	$220,750	$228,750	$303,750
Depreciation†	50,000	50,000	50,000
	$170,750	$178,750	$253,750
Federal corporation tax	20,400	21,360	30,360
	$150,350	$157,390	$223,390
Dividend on 75,000 shs. no par common at $1	75,000	75,000	75,000
	$75,350	$82,390	$148,390
Earnings per share on common stock	$2.04	$2.09	$2.97

*Estimated by Richard K. Meade & Co., industrial engineers, Baltimore, Md.

†Ample depletion reserve and $85,000 repair account deducted from gross earnings.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Portland Cement,[3] 100 shs., par $10	$100 for the lot	.....
American Portland Cement,[3] 400 shs., par $10	$400 for the lot	.....
American Portland Cement,[3] 100 shs., par $10	$75 for the lot	.....
Atlantic Gypsum Products 1st 6s, 1941 ($28,000)[3]	$7400 for the lot	.....
Blue Diamond Materials, 10 shs. pfd.[5]	$10 for the lot	.....
Florida Portland Cement (Del.),[3] 50 shs. com., no par and 50 pfd.	$450 for the lot	.....
Florida Portland Cement, 10 shs. pfd. and 5 shs. com.[6]	$100 for the lot	.....
Indiana Limestone, 200 shs. pfd. and 1000 com., no par[4]	$2000 for the lot	.....
Rockland and Rockport Lime, 330 shs. pfd., 85 2nd pfd. and 135 com.[10]	$55 for the lot	.....
Rockland and Rockport Lime Corp., 50 shs. 1st pfd.[11]	$40 for the lot	.....
Standard Rock Asphalt, 1200 shs. no par stock[4]	1¾	.....
Tory Hill Sand and Gravel, 13 shs. 8% pfd.[8]	$1 for the lot	.....
Tory Hill Sand and Gravel, 13 shs. com., no par[8]	$1 for the lot	.....
United Feldspar, 388 shs. pfd., 647 com.[9]	$1000 for the lot	.....
Universal Gypsum, 100 trustees cert., no par[7]	$1 for the lot	.....
Universal Gypsum, 500 shs. com., no par[9]	$12 for the lot	.....
Universal Gypsum and Lime, 300 shs.[1]	$4 for the lot	.....
Universal Gypsum and Lime, 200 shs.[1]	$2 for the lot	.....
Vulcanite Portland Cement, 300 shs. com., no par[3]	$425 for the lot	.....

[1]Price at auction by Adrian H. Muller & Son, New York, August 6, 1930. [2]Price at auction by Adrian H. Muller & Son, New York City, November 19, 1930. [3]Price at auction by Adrian H. Muller & Son, New York City, December 10, 1930. [4]Price at auction, Adrian H. Muller & Son, December 24, 1930. [5]Price at auction, R. L. Day & Co., Boston, December 17, 1930. [6]Price at auction, Barnes & Lofland, Philadelphia, December 17, 1930. [7]Price at auction, A. J. Wright & Co., Buffalo, December 17, 1930. [8]Price at auction, Adrian H. Muller & Son, December 17, 1930. [9]Price at auction, Adrian H. Muller & Son, December 31, 1930. [10]Price at auction, R. L. Day & Co., December 31, 1930. [11]Price at auction, Wise, Hobbs & Arnold, Boston, December 31, 1930.

Nonmetallic Minerals Hold Prominent Place at Engineers' Meeting

By a Special Correspondent

THE ACTIVITIES of the American Institute of Mining and Metallurgical Engineers, the largest organized group of mining engineers in the world, cover every branch of mining and ore treatment, including petroleum, coal, gas, metals and nonmetallics. At its recent annual meeting held at the Engineering Building in New York City from February 16 to 19, Robert E. Tally, general manager of the United Verde Copper Co., Jerome, Ariz., was elected president for the ensuing year.

Many papers were presented on a great variety of subjects. Sessions were held on mining and milling methods, mine ventilation, ground movement and subsidence, iron and steel, nonferrous metallurgy, engineering education, coal, petroleum, geophysical prospecting, mining geology and nonmetallic minerals. Most of the papers are of only general interest to rock products manufacturers.

Program of Nonmetallics

One session, however, was devoted to subjects that are interesting to nonmetallic mineral producers. The program was prepared by the Committee on Nonmetallic Minerals, of which Dr. Oliver Bowles of the Building Materials Section, U. S. Bureau of Mines, has been chairman. This committee, consisting of 42 members, is made up of representative men in the industries from all parts of the country. In addition to a general committee there is a sub-committee on crushed stone, sand and gravel, one on cement, one on lime and gypsum, and one on clay products. While the entire field of the nonmetallics is thus covered, an effort is made to secure papers that are of the most general interest to the group as a whole. This is difficult because the field is so diversified, but the papers recently presented were of unusual interest to many engineers.

Light-Weight Aggregates

The first paper was entitled "Scope of the Light-Weight Aggregates Industry" by H. Herbert Hughes of the Building Materials Section, U. S. Bureau of Mines. The great need in many types of building construction, notably in bridges and floors, for lightweight concrete that will have adequate strength and durability, has created a wide interest in strong porous aggregates. The author presented on a large map the locations of possible sources of natural porous aggregates of volcanic origin, and also the centers of manufacture and consumption of the chief synthetic varieties. Light-weight aggregates fall into three groups: (1) those which occur naturally such as volcanic cinder, tuff, pumice and coal; (2) those formed as by-products in industrial processes such as cinders, slag and sawdust; and (3) manufactured aggregates the chief of which are Haydite, Pottsco, Cel-Seal, Lytag and Corlite. Haydite is a vesicular, clinkerlike aggregate produced by calcining clay or shale in a rotary kiln. Pottsco is a specially cooled granulated slag. Lytag and Cel-Seal are special types of burned clay products. Corlite is manufactured by sintering a mixture of fluxing material and chemically treated anthracite ashes. Greater detail regarding these materials is given in Mr. Hughes' paper which has been published as Technical Publication No. 405 of the A. I. M. E., obtainable from the secretary's office, 29 W. 39th St., New York City. Emphasis was placed on the potential field for expansion of light-weight aggregate production in the East and South. Written and oral discussion of the paper brought out additional information on sources of natural porous aggregates in the West, and sources of raw materials in other parts of the country. Clays that may be condemned as useless for ceramic manufacture may be quite satisfactory for making aggregates.

Premature and Hangfire Explosions in Quarry Blasting

The second paper on "Premature and Hangfire Explosions in Quarrying," by F. F. McLaughlin, is of interest to all quarry operators, because it deals with the ever-present problem of safety. Mr. McLaughlin spoke with authority on the subject because of his long practical experience as general superintendent of the plants of the General Crushed Stone Co. at Syracuse, N. Y. While the paper presented little that was new in blasting, its chief merit was the emphasis given to the necessity for having intelligent blasting rules, and for following these rules implicitly. Proper storage of both explosives and detonators was urged. Protection of the explosive from the weather and care in loading are of the utmost importance. The handling of misfired holes is so uncertain and dangerous that every effort should be made to avoid misfires. In discussing this paper Spencer P. Howell, explosives specialist of the Bureau of Mines, urged the desirability of the two wires leading from a blasting cap being of different colors as a means of avoiding mistakes in connecting the caps. Others contributing to the discussion included such blasting specialists as Mr. Kimball of E. I. du Pont de Nemours and Co., Inc., and N. S. Greensfelder, editor of *The Explosives Engineer*.

Technical Progress

The third paper on the subject of "Recent Technical Developments in the Nonmetallic Mineral Industries" was presented by Oliver Bowles. As chairman of the committee, and with the assistance of many committee members, he compiled a brief review of the most outstanding technical advances in this wide field during 1930. A few of them affecting the larger groups of rock products industries may be mentioned. Closed-circuit grinding and slurry filtration have attained prominence in cement mills. Clays are being purified by air separation in place of settlement in water. Research has been directed toward superior high-alumina refractories, and power pressing of fire-clay refractories. Diamond saws, drum sanders and cone classifiers are finding a place in slate mills. The use of classifiers, vibrating screens, gravity concentration, and flotation are accomplishing a gradual transformation in phosphate rock milling, with a great reduction in the proportion of waste. Fluorspar flotation has become commercially successful. Electromagnetic methods are employed to prepare a high-grade granular feldspar for the glass trade. Light-weight building materials that are strong and that have high insulating value for both heat and sound are demanding increased attention. They include such products as mixtures of cement and diatomite, wood shavings treated with magnesium salts, porous gypsum products, and clinker block made from anthracite ash.

Points from the Discussion

As the paper had been preprinted in the January issue of *Mining and Metallurgy*, it was presented in abstract. In the discussion that followed F. W. Davis, combustion engineer of Newark, N. J., directed attention to the advantages of certain types of high alumina refractories for furnace lining. Walter F. Pond, state geologist of Tennessee, described the recent wider use of the Crab Orchard, Tenn., sandstone which splits readily into thin layers suitable for flagging or roofing tile. The heavier beds are used as wall stone. Thus floor, walls and roof may all be made of stone from the same quarry. W. M. Weigel spoke of the wider use of cull gem diamonds for drilling purposes in soft rock. They are much less costly than the Brazilian carbona-

does, but break much more readily on account of their good cleavage.

Practical Marble Geology

The fourth subject, "Commercial Development of Marble Deposits," was presented orally by Prof. George W. Bain of Amherst college. Professor Bain has spent several summers in detailed geological studies of the great marble belt of western Vermont. His discourse was illustrated with many interesting lantern slides. He pointed out first the importance of the waterfalls on Otter Creek, which provide ample electric power for the mines, quarries and mills. The second point was the importance of sand supplies. Only where streams have worked over the glacial drift and assorted the materials are suitable local sands to be found. Geological studies have resulted in locating certain sections of outwash fans where sands of desirable quality have accumulated. Abrasive sands are necessary in sawing and rubbing marble slabs. The marble beds are greatly folded and contorted, and an intimate knowledge of their geology is essential to intelligent development. In some places pressure has caused many fractures to appear, and it is difficult to obtain sound blocks. In other places pressure and temperature were so high that the rock was in a semi-plastic condition and flowage took the place of fracture. The ornamental markings on marble are due to this flowage. Certain bluish beds that disfigure white marble are attributed to the action of vapors and gases that carried away certain constituents during their passage through the marble, thus leaving an undesirable color. A determination of the sources of such gaseous intrusions may enable one to trace the regions where blue beds are most likely to occur.

Nonmetallics of Southern Illinois

The fifth and final paper of the session covered the "Mineral Resources of Extreme Southern Illinois." It was presented by J. E. Lomar of the Illinois Geological Survey and was illustrated with many interesting lantern slides. Fluorspar is one of the most important minerals of the district, as a very large proportion of all the fluorspar produced in the country is obtained from this small area and the adjoining district in Kentucky. The fluorspar occurs in three types of deposits, veins, bedded deposits and gravels. Increasing importance is being attached to the bedded and gravel deposits because of the great volume of water encountered in the deep vein mines. The clays of this vicinity include the more common brick and tile clays as well as high grade kaolin and refractory clays. Other important minerals and rocks of the area are limestone, both rough and structural; sandstone for building purposes, cement materials, sand, gravel, fuller's earth, silica, ganister, ocher, and potash shales.

Dr. Oliver Bowles, who has served the committee as chairman for the past four years, resigned at the close of the recent convention and has been succeeded by W. M. Weigel, mineral technologist of the Missouri Pacific railway, with headquarters at St. Louis, Mo. Mr. Weigel has had long experience in practical mining, also as a mineral specialist in the Bureau of Mines, and during recent years in his present work. He brings to the committee a wealth of knowledge of nonmetallic minerals, and a very wide acquaintance with operators and mining engineers.

Developing Resort

ANOTHER STEP in the development of the Lincoln lakes as a summer playground was completed recently with the finishing of pumping 50,000 tons of material into the large lake nearest Lincoln by the Lincoln Sand and Gravel Co., Lincoln, Ill.

The material was taken from a large levee which separated the large lake from the lake in which the gravel company pumped the last three seasons.

By pumping out the levee there is now a lake almost a half mile in length and a quarter of a mile in width.

Additional equipment such as bath houses, floats, wharves and diving boards will probably be built early this spring in time for the bathing season.—*Springfield* (Ill.) *Journal.*

U. S. Bureau of Public Roads Opens Up Aggregate Competition in North Carolina

THE STATE HIGHWAY COMMISSION of North Carolina must change its present method of securing all crushed stone for road construction from the state prison, which in turn secures the stone from one interest, if the state is to participate further in federal aid road funds, Thomas H. McDonald, chief of the United States Bureau of Public Roads, informed the delegation of highway and prison officials who conferred with him.

The delegation, composed of Charles Ross, attorney, and John D. Waldrop, engineer, of the State Highway Commission, and J. W. Bunn, chairman of the State Prison Board, went to Washington in an effort to secure federal approval of the $1,500,000 worth of road work included in the last highway letting, and to ascertain what changes in the present arrangement would be necessary for further expenditure of federal funds in this state.

Mr. McDonald agreed to approve the projects included in the last letting on February 10, inasmuch as they are to be paid for from the emergency employment fund which must be expended by September, and delay in getting the work under way might mean that the state would lose the immediate use of the fund.

He said, however, that he would not approve additional bids based on the present arrangement between the highway commission and the state prison. The highway commission has a contract with the prison agreeing to purchase coarse aggregate (which includes crushed stone and gravel) from the prison, and requires contractors bidding on highway work to use prison stone, which is furnished them at the specified price of $1.27 per ton plus the freight from the nearest of four base point quarries. The state prison has an additional exclusive contract with companies owned or controlled by R. G. Lassiter by which the prison agrees to secure all of its stone from his quarries, and these quarries in turn use prison labor for crushing the stone.

A portion of the stone which the highway commission purchases from the prison is that which the prison has received in payment for the work of prisoners, but a larger portion is secured by the prison from Lassiter quarries and resold to the highway commission, the result of the combined contracts being that the Lassiter quarries have a complete monopoly on stone used by the state in road work.

Mr. McDonald agreed to approved a proposed change in the present arrangement permitting contractors to bid on road work using either gravel, commercial stone or prison contract stone. His approval will affect not only the present program in which the state is beginning a $4,000,000 construction program almost entirely from federal funds, but also the regular federal-aid funds.

Competitive bidding on gravel is expected to be the greatest actual change resulting from the conference, inasmuch as there are no commercial quarries outside the Lassiter quarries operating in the state at present and hence the "competitive" bids on stone will be largely from the same source as the prison contract stone.—*Raleigh* (N. C.) *News and Observer.*

New Sand and Gravel Company Organized in Indiana

FORMATION of the Pillman Sand and Gravel Co., to be located at Ninth avenue and Ohio street, Evansville, Ind., was announced recently by Charles H. Pillman, 1206 South Governor street. Articles of incorporation provide for 300 shares at no par value.

Mr. Pillman secured the company's first contract from Vanderburgh county and will supply half of the gravel for 1931.

Gravel for Indiana state highway projects in the county will also be furnished them.

Marion J. Rice, 1204 E. Blackford avenue, is president, and Mr. Pillman vice-president. Other incorporators are James Wilson, 2105 W. Illinois street; Robert J. Melcher, 319 East Franklin street, and Charles J. Eichel, Sr.—*Evansville* (Ind.) *Press.*

Profits in the Cement Industry

THE NATIONAL CITY BANK OF NEW YORK, in its March economic bulletin, gives a financial survey of the portland cement industry that corroborates in every way the editorial in ROCK PRODUCTS, February 28, and our own annual review of the industry in the January 3 issue—not to mention the general trend of our editorial comments for a year or more. Of all the building material industries there is less excuse for portland cement manufacturers' lack of profits than probably any other, for the business has been there in sufficient volume to have justified a fair profit, if the manufacturers themselves had taken a sane view of the situation.

Under the circumstances, to accuse cement manufacturers of collusion to fix prices, as Senator Norris has done, and as certain newspapers and politicians are constantly doing, is absurd, and would be comical to those who know the real conditions, were it not more pathetic as a commentary on the proverbial optimism of American producers, and their utter lack of application of a few fundamental principles of business economics. The National City Bank's analysis follows, verbatim:

Analysis by National City Bank

"Although the immediate cause of the decline in corporation profits last year was the reduced volume of general business and falling prices, a more fundamental difficulty besetting many industries is the excessive investment of new capital for the expansion of productive capacity during recent years. Of this, the cement industry affords an example. Here is an industry that for many years had enjoyed an almost uninterrupted growth and whose product is used in a countless variety of ways.

"Last year the Portland Cement Association estimated that approximately 32% of all cement was used in concrete roads, streets and alleys and 25% for structural concrete in commercial, industrial, public and private buildings, the remainder being distributed in sewerage, drainage, irrigation and water power projects, bridges, railways, rural uses, masonry blocks, etc. The tall skyscrapers, huge dams and other spectacular projects account for a surprisingly small portion of the total consumption of cement, the bulk of the demand coming from the more commonplace building groups.

"During 1930 the nation's road building program was carried forward with increased effort because of its effect in enlarging employment, the state of Iowa leading all others with the construction of more than 1000 miles of paved highways. Not all the money spent for materials is for cement, however, a large part going for sand, gravel and stone, while the cost of labor for excavating, grading and laying pavement is usually fully as much as for materials, so that the purchase of cement constitutes only 10 to 15% of the total expenditure. In the construction of steel frame buildings a considerable amount of concrete is used, as well as brick and stone, but it usually contains a large part of cinder or other aggregate and a much smaller amount of cement in relation to its size or cost, than a single family residence. For every large building constructed there are literally hundreds of private dwellings, each requiring 50 to 100 bbl. of cement for its foundation, cellar, sidewalks, driveways and perhaps stucco exterior.

"While there was a decline last year in new building construction amounting to more than 21%, according to the F. W. Dodge Corp. figures, there was an increase of nearly 15% in contracts awarded for public works and utilities, the most important item of which is highways. There was a decrease of but 6% in shipments of cement, hence it might possibly have been supposed that the industry was having a highly prosperous year.

"As a matter of fact, this was not the case. Annual reports that have recently been issued by thirteen representative domestic manufacturers of cement show that net profits, after all charges but before dividends, in 1930 were about 10% lower than in 1929, and while this in itself is not a large decline measured against the decreases shown in many other industries, it follows a decrease of 32% in 1929 from 1928 when industry generally was enjoying a big increase. The rate of profits return on capital and surplus showed a marked decline, as may be seen from the following summary of the statements of the group:

THIRTEEN DOMESTIC CEMENT MANUFACTURERS
(In thousands of dollars)

	1928	1929	1930
Capital and surplus, January 1	$172,178	$173,323	$177,825
Net profits for year	14,271	9,732	8,762
Profits return on capital and surplus	8.3%	5.6%	4.9%

"A decrease in last year's earnings as compared with 1929 was reported by the majority of companies, although four were able to show gains. Figures of the Universal Atlas Cement Co., the largest producer, are not included, for the reason that it is a subsidiary of the United States Steel Corp. and does not publish a separate statement.

Over Expansion of Plant Capacity

"The explanation of the declining trend of earnings is to be found in the excessive expansion of manufacturing capacity during the past few years. Growth of the domestic industry has been almost phenomenal, as may be seen from the following table showing plant capacity and production by ten-year intervals up to 1920 and by single years up to 1930. Ratio of finished cement produced to manufacturing capacity is also given so as to show the decreasing percentage of capacity utilized in recent years.

CEMENT PRODUCTION AND CAPACITY
(In thousands of barrels)

Year	Estimated capacity	No. of plants	Annual production	Pct. production of capacity
1880	(*)	(*)	42	(*)
1890	(*)	16	335	(*)
1900	(*)	50	8,482	(*)
1910	97,670	111	76,550	78.3
1920	146,400	117	100,023	68.3
1921	144,354	115	98,842	68.5
1922	146,203	118	114,790	78.5
1923	161,858	126	137,460	84.9
1924	175,100	132	149,358	85.3
1925	193,558	138	161,659	83.5
1926	215,300	140	164,530	76.4
1927	227,080	153	173,207	76.2
1928	243,702	156	176,299	72.3
1929	259,344	163	170,646	65.7
1930	260,000†	165	160,905	61.8

*Not computed. †Partly estimated.

"Between 1920 and 1925, plant capacity was enlarged by 34% and production increased 62%, thereby raising the ratio of operations from 68.3 to 83.5% of capacity. Evidently the favorable conditions of these years encouraged investment unwarranted by demand, for in the next five years plant capacity was enlarged by 34% while production decreased slightly, thus lowering the operating ratio to 61.8% of capacity, which is the lowest ever registered since the computation of the figures began in 1907, save in 1918-1919 when building construction was at a standstill due to the war and tight money market conditions.

"Accompanying the marked increase in capacity since 1920, there was a steady decline in prices, and present average factory price for all plants in the country is the lowest in many years. In some sections of the country the situation is worse than others. In the Mountain and Pacific states, the shipments of cement last year represented less than 50% of plant capacity. Even in the Middle Western states, where percentage of idle capacity was the lowest of any district, the keen competitive conditions that prevail illustrate how a relatively small overproduction by a few companies can break the price structure to the detriment of the entire industry.

"Importation of foreign cement has further aggravated the competitive situation existing in the domestic markets, particularly in the cities located on or near the Atlantic Seaboard. A duty of 6c per 100 lb., or 23c per bbl., was included in the 1930 tariff law but apparently has been insufficient to protect American producers against the importations of foreign cement, which still continue although in smaller volume.

Because of the manner in which foreign cement is sold, it has a disrupting influence upon prices far out of proportion to its actual amount.

"As a result of these conditions, the securities of most of the representative cement companies are at present selling at a substantial discount below their book values in spite of the comfortable financial position shown by their latest statements.

"Whenever the cement industry, or any other industry, becomes over-developed, the only remedy is to suspend further expansion until such time as demand again assumes a proper relation to capacity. No one can say precisely what this relationship should be, for every industry needs to carry a certain amount of surplus capacity to meet peak seasonal requirements, to allow for repairs to machinery and to provide for the continual shifting in demand among different sections of the country. Healthy competition stimulates efficiency and economy in operations, and tends to lowering of costs. Addition of too much new capital, however, must inevitably be followed by a reaction that has a disastrous result to all concerned—not only to the companies already established, but to the investors, to labor, to allied industries that are founded to supply an imaginary demand, and to the communities themselves, because the projects are fundamentally unsound in principle."

Cement and Building Material Manufacturers Achieve Credit Co-operation

By E. B. Odenkirk

Credit Manager, Medusa Portland Cement Co., Cleveland, Ohio

MANY of the manufacturers of portland cement realized several years ago, at the height of overtaxed credit, that the extensive reaches of their business made the proper granting of credit an extremely important function.

They believed there was a need for co-operation and mutual protection in dealing with the distributors of their products, both in the vicinity of their plant and corners far removed.

It was apparent that some concerted effort was imperative to establish a more thorough means of central co-operative control. In visualizing the situation it became quite clear that co-operation in "credit" and not competition was most needed.

Beginning with the year 1928 an awakened interest in the welfare of the industry led to a more intensive study of "credit" and its bearing on conditions in the building industry, by about 50% of the manufacturers, and this was accompanied by a concerted effort to "sell" the "group" plan for study of statistics gathered through a medium of exchange, or more or less a statistical office, to the other competitive manufacturers who had been indifferent up to that time.

This group, orginally composed of only a small percentage of competitive manufacturers who in many cases sold the same distributors, finally took root in earnest late in 1929 and early in 1930 and the group activities rapidly gained momentum until in November, 1930, the group roster contained the names of approximately 95% of the manufacturers of portland cement east of the Rocky mountains, together with a number of lime, gypsum and allied producers, who by the fact of membership in the "group" signify the belief in the present need for co-ordinated credit co-operation.

Allied with Association of Credit Men

This national credit activity is recognized as "The Building Material Manufacturers Credit Group" and is associated with the National Association of Credit Men, which organization lends the color of national activity and at the same time the National Association does all of the mechanical work incident to the furnishing of reports and statistics to the members of this group.

E. B. Odenkirk

The best basis for proper credit granting can only be established by determining first the habits and reputation of the party to be sold, and most important of all the information on which the credit is granted must be up to date, and must constantly be supplemented by current "flashes" that may change the buyer's credit status over night.

At the present time with conditions changing so rapidly, caused by many reasons, such as severe competition, declining prices and profits, and general need for liquidation, if credit information is to mean anything, it must be kept up to date.

The general sources of information best known to the average credit grantors cannot furnish information of this character simply because the field is too generally covered and no specific group in any industry is specialized upon. Important credit information, especially the kind most needed in the age of rapid changing of conditions and with commercial failures at their highest point in years, should be preferably obtained through group interchange of information since the necessity of group control is now more apparent than ever before.

First Indication of Weakened Credit

It is a recognized fact that the first indication of improperly proportioned finances is evidenced by the inability of the buyer to pay his commitments in accordance with the terms agreed upon at the time of purchase.

Since the granting of credit is based upon the ability of the buyer to pay promptly and without violation of fair trade practices the Building Material Manufacturers Credit Group has built the foundation on this principle.

Since a clear picture of the buyer's ability to pay can only be determined by "Credit Control" through this source of supply, the group activity is to segregate into various groups such members as will be interested in selling a specific type of account.

Mutual Interest in Building Field

In the building material field, as in many other industries, the outlet for the product is pretty generally the same so the interest is mutual and the group credit control is more effective than otherwise.

As an illustration, it would not be profitable to place among its members a manufacturer of machinery since the interest would not be mutual and no value would be derived from the manufacturer of machinery.

Building and construction materials and allied lines are generally sold through rec-

ognized building material dealers or contractors, and the major commodities required by building material dealers or contractors are cement, lime, gypsum, ceramic products, sand, gravel, stone, etc., so including in group activities, concerns making and selling such articles contributing credit information the group effect is far reaching in its credit control and reduces to a minimum the present general trend towards the abuse of trade ethics.

Just How It Works

The method of procedure in this group is briefly as follows:

Each member pays an annual membership fee, this being the same to each member regardless of the size of his sales volume and the cost of operation is supported solely by these fees and no outside donations or contributions are solicited or accepted.

In determining the value of the report to each member and the cost to be paid, the larger member, of course, furnishes more information and in addition more information can be secured from the larger member so that in turn the smaller member is receiving more information than he actually contributes. Thus there is a general average derived from the service.

The group is furnished with a secretary who is located in the offices of the National Association of Credit Men. He serves in the capacity of statistician, arbitrator, and contact man for the group.

One important function of the group is to publish each month a list of each member's "accounts receivable" experience. This list reaches each member's hands by the 10th of each month, which reflects as of the first of each month actual conditions of its buyers' paying reputation.

The group members also furnish each month a "customers sold" list, which is, after serving its "group" purpose, dovetailed into the National Association of Credit Men's national clearance system and becomes a part of the perpetual National Clearance of Credit information on hundreds and thousands of American business concerns.

This monthly information service is further supplemented from the time of publication of the subsequent list with what is called the "flash" system, relaying current information regarding anybody previously reported secured through credit channels in addition to information contributed by its members, so that all experience is constantly up to the minute.

In addition to this service, sectional meetings are held every three months at which time various credit executives of the manufacturers meet to discuss their views and become better acquainted with each other, which is a most important function in reducing suspicion and competition in "credits."

There is also a national meeting held once each year where each member sends a representative. The next national meeting is planned to be held in Cincinnati in the latter part of April, 1931.

There are no rules or regulations that govern a member's actions on delinquents. The only penalty imposed is that by the member himself who does not heed the "stop, look and listen" sign, which brings upon him a financial loss of not only interest on an account but in many cases the principal itself.

The National Association of Credit Men affiliation also puts at the members' disposal their national "business service" activities, to function in the case of insolvent or embarrassed debtors. This service renders helpful and unbiased service in policing such type of debtors and also co-operates where a debtor requires special assistance financially. The business service department acts as advisor, and if the occasion warrants gives such assistance as will return the debtor to normal financial standing.

The need of co-ordinated credit co-operation and credit control is more and more a necessity than ever before and this fact is evidenced by the remarkable interest and growth shown in these "group activities" during the past year.

First Contract for Cement for Hoover Dam Goes to Monolith

THE FIRST CONTRACT for cement for Hoover Dam was awarded Feburary 28 to the Monolith Portland Cement Co., of Los Angeles, Calif., when the Secretary of the Interior, Ray Lyman Wilbur, approved the transaction. The contract was for 20,000 bbl.

The Monolith company bid $1.50 per bbl., net, or $30,000, less 40c per bbl. for sacks returned. The sack allowance amounts to $8000. The government must pay freight charges from Monolith, Calif., to the site of the dam near Las Vegas, Nev., amounting to $19,000. The cement will thus cost the government $41,000 delivered. Ten proposals for supplying the cement were received, and these bids were opened February 19 at the Denver office of the Bureau of Reclamation.

Cement Office Workers in a New Role

THE UNIVERSAL ATLAS CEMENT CO. chorus of 70 voices sang several numbers at the reception given by the Western Society of Engineers in the Red Lacquer room, Palmer House, Chicago, February 25. The meeting was held in honor of Ralph Modjeski, consulting engineer, who received the Washington award for 1931. The Universal Atlas chorus is directed by Harry S. Walsh, and is composed of members of the organization in the Chicago office of the cement company.

Marquette Cement Making Extensive Improvements at Cape Girardeau

CONSTRUCTION WORK on the extensive rehabilitation and expansion program at the Marquette Cement Manufacturing Co. plant in South Cape Girardeau, Mo., was inaugurated recently by the Burrell Engineering and Construction Co., of Chicago. Sixty men were put to work by the contracting firm, only Cape Girardeau labor being used, and this force will be increased as needed, according to Joe Taylor, superintendent in charge.

At the present time only preliminary work is being done, as detailed plans for the bulk of the program had not been received from the Chicago offices of the contracting firm. In addition to Mr. Taylor there is a staff of supervisors, including a field engineer, carpenter foreman and labor foreman. A number of men were employed in digging out portions of old structures where a new and modern system of cooling cement clinker will be installed.

Another crew was employed moving one of the new raw grinding mills to the building, where three of them will be installed to take the place of 19 smaller ones now in use. Two new kilns are also to be installed to replace two which have been used for a number of years, it is understood.

The contracting firm will work 24 hours a day in the program, in alternating shifts.

L. A. Harrington and Charles Doerr, engineers for the General Electric Co., which has the contract for replacement, repairing and addition to the power units of the plant, have arrived and begun preliminary work. Two of the company's large turbines are being overhauled, which will take two and a half weeks.

A new turbine of the 6500 kw. size, developing 8000 hp., is to be installed, augmenting the power units. An addition to the power plant structure will be erected to house two new turbines. Within a few weeks the program will be fully under way and will continue for about six months.—*Cape Girardeau* (Mo.) *Missourian.*

Iowa Cement Manufacturers Have at Least One Newspaper Friend

WE HAVE six cement producing plants in Iowa. Their daily output is 22,000 bbl. The yearly production is around 8,000,000 bbl. valued at $13,000,000. These plants employ about 1500 persons. They must compete for business with plants in other states. All these plants are incorporated and must pay 12% of their net earnings to the federal government and taxes on their property to the state and its local subdivisions. It is now proposed to soak them with a special state tax.—An editorial in the *Marshalltown* (Ia.) *Times-Republican.*

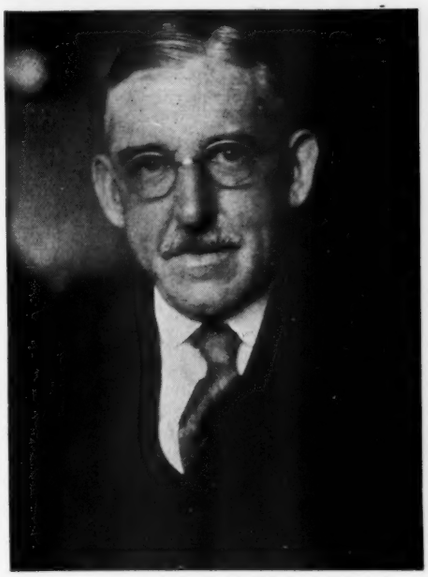
Ed. Shaw's News Letter From Los Angeles

L. L. ROGERS, production and distribution manager of the Consolidated Rock Products Co., told me that he was much pleased to read in the convention number of ROCK PRODUCTS that the use of separated sizes was increasing in the eastern states. "We worked four years," said Mr. Rogers, "to get our four-way-mix started. But now we have it adopted for all state, city and highway departments."

Aggregate Producers Like "Four-Way-Mix"

The "four-way-mix" is the local term for an aggregate made up of three sizes of coarse aggregate and one of sand. This is the usual mix used out here on important jobs. Sometimes, as I wrote recently, even the sand is blended. The specifications permit the contractor to keep pea gravel on hand and add as much as is necessary to keep the fineness modulus constant. Personally, I look for the matter to go farther. There are as good, if not better, reasons for mixing separate sizes of sand as there are for mixing separate sizes of coarse aggregate. In the case of coarse aggregates the idea of using separate sizes is to avoid segregation in transportation and handling. Sand does not segregate in handling but its gradation is, as I believe, of more importance to the strength and uniformity of concrete than that of coarse aggregate, and the only way to keep the gradation constant is to separate it into sizes and recombine, as some eastern and middle-western plants are doing.

"What we wanted," said Mr. Rogers, "was to eliminate the so-called eye inspection. We found that one contractor, or the inspector on this job, would reject a load of material that another contractor or inspector would gladly accept, and both were supposedly working under the same specifications. We also found that if we took the time to look we could find an inspector who would receive almost anything. I once won a bet with a contractor that we could mix a load of material in our yard which would not only be contrary to the specification, but so badly outside that anyone could tell it was wrong by looking at it, and I could send that load out and find an inspector who would accept it. To say it briefly, our experience with eye inspection has been that it is entirely unsatisfactory both for producer and engineer because the personal opinions of inspectors and superintendents were so widely different. We found it discouraging to send out a load of material filling specifications in every particular and then have an inspector contemptuously drag his foot over it and say, 'Take that load back. It is no good'.



Edmund Shaw

No Surplus Now of Pea Gravel

"You tell me that eastern producers, or some of them, are afraid that if they sell separate sizes there will be a strong demand for the coarser sizes and leave them with a lot of unsalable pea gravel on their hands. Our experience has been the opposite. I imagine we have given away or wasted 1,000,000 tons of pea gravel in the past. We did sell a little of it for walks and driveways but we had to give away the greater part of what we produced to railroads and others who could use it, to keep it from accumulating around our plants. But since we adopted selling separate sizes we have sold all that we make. The engineers have found that there is a distinct place in the combined aggregate for such a size and by its use they are producing higher strength concrete than ever before and at the same time gaining in workability and uniformity. Our experience in selling separate sizes has practically solved this problem.

"Our greatest difficulty now is with private jobs. There are so many architects and engineers and even contractors who have their own notions about what they want for materials. It is our experience that it does not pay to make special sizes to satisfy whims and crotchets unless we receive what will appear to the consumer an unreasonable price for the material. It does not pay us to change screens and make all of the other arrangements that are necessary for producing special sizes. With the separate and combined sizes we now produce we believe every requirement in the form of aggregates is met. The most important thing is to mix and use them intelligently and we are willing to aid our customers to do this."

More Black-top Road Construction

I was surprised to learn recently that more bituminous paving is now being laid in this district than has been laid in years. It is rather astonishing to find this to be so because there is hardly any difference now between the price of bituminous paving and portland cement concrete. I am told that the difference where the same contractor has been asked to bid on both types for the same road ranged from 1c to 3c per sq. ft. [Everything goes by the square foot out here.]

I asked for reasons why this should be so, because all of the people whom I have asked about it tell me that they prefer to ride on concrete roads. The explanation given me is that a good many thin and narrow concrete roads were laid years ago and these are now being covered by black top roads of some kind. Another explanation is that the bituminous materials are a byproduct of California's great oil industry and one for which it is difficult to find a market. There is a strong sentiment that as much of this material ought to be used at home as possible. A third reason is that the bitmuinous types of road have been growing decidedly better because of research mostly in the proper gradation of aggregates and in technique of construction.

Of course the aggregate producer is not affected. Neither is the aggregate industry, as all but a few of the plants here produce crushed rock, gravel and sand. Bituminous paving has the first call on the crushed rock. Just at present the demand is so strong that comparatively little crushed rock goes into concrete. What is not wanted for bituminous paving is needed for railroad ballast and similar uses. The big heavy stuff, No. 1, is much in demand. It is used for macadam base and the buyers do not want any rounded pebbles.

Many Unused Gravel Plants

I took a long drive to see the plants in the San Gabriel Wash the other day, and it was a melancholy occasion. So many plants we saw were shut down. However, several of them never should have been started. We are now in the last chapter of the riotous spending of capital for unwanted plants, of sand wars, and of all the rest of the unhappy mess that the aggregate industry here has been in for some years past. In one way it is not pleasant to think about these things, but they have an important lesson for us. Everyone is asking today, "Where has the money gone?" Well, some of it has gone into plants that never should have been built. And we know now that not only the men who built these plants but the public as a whole has had this loss to pay for.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Feb. 7	Limestone Flux Week ended Feb. 14	Sand, Stone and Gravel Week ended Feb. 7	Sand, Stone and Gravel Week ended Feb. 14
Eastern	1,179	1,266	1,125	918
Allegheny	1,432	1,326	1,276	1,121
Pocahontas	119	54	401	398
Southern	536	600	5,980	5,233
Northwestern	208	219	969	802
Central Western	375	411	3,171	3,135
Southwestern	371	296	3,584	3,320
Total	4,220	4,372	16,506	14,927

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1930 AND 1931

District	Limestone Flux Period to date 1930 Feb. 15	Limestone Flux Period to date 1931 Feb. 14	Sand, Stone and Gravel Period to date 1930 Feb. 15	Sand, Stone and Gravel Period to date 1931 Feb. 14
Eastern	13,187	7,745	11,558	7,071
Allegheny	15,024	9,574	15,466	8,820
Pocahontas	1,190	553	3,132	2,644
Southern	3,559	3,363	37,420	36,773
Northwestern	2,998	1,334	5,418	6,105
Central Western	3,059	2,628	30,769	20,341
Southwestern	2,008	1,971	21,664	19,989
Total	41,025	27,168	125,427	101,743

COMPARATIVE TOTAL LOADINGS, 1930 AND 1931

	1930	1931
Limestone flux	*41,025*	*27,168*
Sand, stone, gravel	*125,427*	*101,743*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of March 7:

SOUTHERN FREIGHT ASSOCIATION DOCKET

54069. **Gravel and sand,** from Twohy Siding, Va., to N. S. R. R. stations in North Carolina. Present rates, to Sunbury, N. C., 165c; to other points, 196c per net ton. Proposed rate on gravel and sand (except glass and molding sand), carloads, minimum weight 100,000 lb. (when 90% of marked capacity of car is less than 100,000 lb. such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity actual weight shall govern, per ton of 2000 lb., from Twohy Siding, Va., to N. S. R. R. stations, viz., Sunbury, Cross, Wardville, Trotville, Robbsville, Clidin, Ryland and Center Hill, N. C., 150c per net ton, based on the Docket 17517 relief line scale for short line distances.

54113. **Sand, gravel (washed or unwashed), clay gravel, crushed stone and slag,** between stations on the G. N. Ry. and on the G. A. S. & C. Ry., also between stations on these lines on the one hand and stations in S. F. A. territory on the other. It is proposed to establish the main line or standard line basis of rates on sand, gravel (washed or unwashed), clay gravel, crushed stone and slag, carloads, between stations on their respective lines and between stations on these lines on the one hand and stations located on carriers within the scope of territory covered by I. C. C. Docket 17517 on the other, both on interstate and intrastate traffic.

54168. **Sand, silica, washed or processed,** Oregon, Ill., to Nashville, Tenn., Atlanta, Elberton and Macon, Ga., and Chattanooga, Tenn. At present combination rates apply. It is proposed to establish rates on sand, silica, washed or processed, carloads (See Note 3), from Oregon, Ill., to Chattanooga, Tenn., $4.15; Nashville, Tenn., $3.70; Atlanta, Ga., $4.50; Elberton and Macon, Ga., $4.65 per net ton, same as currently in effect from Ottawa, Ill.

54187. **Phosphate rock, crude, lump or ground** (not acidulated), from Wallace, Ky., to points in North Carolina, South Carolina, Tennessee and Virginia. It is proposed to cancel the present rates on phosphate rock, crude, lump or ground (not acidulated), carloads, minimum weight 20 net tons, from and to the above named points published in Southern Ry. I. C. C. No. A-9561. Class rates to apply after cancellation.

54210. **Stone, crushed or rubble,** Vick, N. C., to A. C. L. R. R. stations, Duke Hall, N. C., to and including Norfolk, Va., Newport News, Va. It is proposed to cancel, on the obsolete theory, the present rates on stone, crushed or rubble, carloads, from and to the above named points, published in Agent Glenn's I. C. C. A655 and allow I. C. C. Docket 17517 scale rates as published in Agent Glenn's I. C. C. No. A-655 to apply.

54214. **Sand,** from Dixiana, S. C., to Star, Duncan, Varina, Farmville, Marsden, Mackeys and Edenton, N. C. At present combination rates apply. It is proposed to establish rates on sand, carloads (See Note 3), from Dixiana, S. C., to Star, N. C., 165c; Duncan and Varina, N. C., 170c; Farmville, N. C., 195c; Marsden, N. C., 200c; Mackeys, N. C., 205c; and Edenton, N. C., 215c per net ton.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

54229. **Agricultural limestone (ground),** Franklin, Tenn., to stations on the N. C. & St. L. Ry. It is proposed to establish a scale of rates for application on agricultural (ground) limestone, carloads, minimum weight 60,000 lb., from Franklin, Tenn., to N. C. & St. L. Ry. stations. Present and proposed rates from Franklin to representative points of destination are as follows (in cents per ton of 2000 lb.):

To	Pres.	Prop.
Dickson, Tenn.	183	110
Johnsonville, Tenn.	183	130
Bruceton, Tenn.	194	140
Lexington, Tenn.	194	150
Somerville, Tenn.	205	180
Murray, Ky.	194	160

SOUTHWESTERN FREIGHT BUREAU DOCKET

22389. **Mixed sand and cement,** from Chicago, Ill., to Oklahoma City, Okla. To establish a rate of 32c per 100 lb. on mixed sand and cement, in bags, in straight carloads, minimum weight 40,000 lb., from Chicago, Ill., to Oklahoma City, Okla. An interested shipper is engaged in the mixing of cement and sand and shipping the commodity in paper bags to various points, each bag weighing approximately 80 lb., the value of which is about 35c. There is no specific rating applicable at present other than that applicable under Rule 10 of the Western Classification, which provides for the rating of the highest rated article in the mixture. The interested shipper has approached the Classification Committee in an endeavor to establish specific ratings on the commodity involved, but has also requested the publication of commodity rates as proposed to destination points shown in this application. The proposed rate to Oklahoma City is figured between that applicable on sand and that applicable on cement.

CENTRAL FREIGHT ASSOCIATION DOCKET

27704. To establish on **stone, viz., quarry waste or tailings,** in carloads (See Note 1), except when car is loaded to full cubical or visible capacity actual weight will apply, from Sibley, Mich., to Coldwater, Mich., rate of 75c per ton of 2000 lb. Present rate, 85c per ton of 2000 lb.

27717. To establish on **crushed stone and crushed stone screenings,** carloads (See Note 3), from Delphos, O., to Toledo, O., rate of 60c per ton of 2000 lb. Route—Via N. Y. C. & St. L. R. R. direct. Present rate, 70c per ton of 2000 lb.

27718. To establish on **rubble stone,** carloads (See Note 3), from Lannon, Wis., to Utica and Battle Creek, Mich., rates as shown below:

To	Pres.	Prop.*
Utica, Mich.	25½	$2.35
Battle Creek, Mich.	21½	1.96

*Per net ton.

27720. To establish on **sand and gravel,** carloads (See Note 3), from Indianapolis, Ind., to Elizabethtown, Ind., rate of 85c per net ton. Route—Via C. C. C. & St. L. Ry., Westport, Ind., and C. M. St. P. & P. R. R. Present rate, 13c (Official Classification basis).

Sup. 1 to W. D. A. 27130. White Docket Advice 27130, Docket Bulletin 1905, dated December 23, 1930, covering proposal to establish rate of 90c per ton of 2000 lb. on **burnt or refuse foundry sand,** carloads, from Sharon, Penn., to Cleveland, O., is hereby withdrawn from the docket.

27728. To eliminate Dyer, Ind., as an origin point shown in the list of Chicago district stations in C. F. A. L. Tariff 197M, naming rates on **sand, gravel and crushed stone,** to points in Illinois, Indiana, Michigan and Ohio, account commodities not produced at that point.

27729. To establish on **agricultural limestone,** in carloads, minimum weight as per Official Classification, from Genoa, Martin and Luckey, O., to Warwick, O., and Genoa and Martin, O., to Warsaw Jct., O., rate of 8c. Present rates—From Genoa and Martin, O., to Warsaw Jct., O., 8½c.; from Genoa and Martin, O., to Warwick, O., 10c, and from Luckey, O., to Warwick, O., 8½c.

27731. To establish on **agricultural limestone,** carloads, minimum weight 50,000 lb., from Marblehead and Danbury, O., to destinations in New York and Pennsylvania, and representative points rates as shown in Exhibit A attached. Present rates as shown in Exhibit A attached.

EXHIBIT A
From Marblehead and Danbury, O.
To representative points

N. Y. C. R R.	Pres.	Prop.
Springfield, Penn.	200	189
Lillydale, N. Y.	230	202
Falconer, N. Y.	230	202
Russell Penn.	230	202
Youngsville, Penn.	230	202
Grand Valley, Penn.	230	202
Jamestown, Penn.	200	189
Raymilton, Penn.	230	202
Branch, Penn.	220	202
Reno, Penn.	230	202
Farrell, Penn.	190	189
Wheatland, Penn.	190	189
B. & O. R. R.		
Chewton, Penn.	230	202
Washington, Penn.	230	202
West Newton, Penn.	260	202
Edenborn, Penn.	270	242
B. & L. E. R. R.		
Butler, Penn.	230	202
Springboro, Penn.	200	189
Munhall, Penn.	410*	202
B. R. & P. R. R.		
Indiana, Penn.	290	262
Falls Creeks, Penn.	370	265
Monongahela R. R.		
Leckrone, Penn.	270	242
Montour R. R.		
McDonald, Penn.	410*	202
Pennsylvania R. R.		
New Galilee, Penn.	230	189
Pittsburgh, Penn.	230	202
Carnegie, Penn.	230	202
Canonsburg, Penn.	230	202
Moravia, Penn.	190	189
Walford, Penn.	230	189
Pulaski, Penn.	190	189
Ambridge, Penn.	230	202
Apollo, Penn.	230	202
Sligo, Penn.	370	265
P. & L. E. R. R.		
New Castle, Penn.	190	189
Pittsburgh, Penn.	230	202
Leckrone, Penn.	270	242
P. C. Y. R. R.		
Beechmont, Penn.	410*	202
P. W. V. R. R.		
Bridgeville, Penn.	230	202
Carnegie, Penn.	230	202
Pittsburgh, Penn.	230	202
W. A. R. R.		
Dewey, Penn.	410*	202

*Sixth class rates.

27732. To establish on **crushed stone, crushed stone screenings and agricultural limestone** (not ground or pulverized), in open-top cars, carloads (See Note 3), from Narlo, O., to points in Michigan and Indiana, rates as illustrated in Exhibit B attached. Present rates, sixth class.

EXHIBIT B

From Narlo, O.

To Mich. pts.	Rte.	Prop.	To Mich. pts.	Rte.	Prop.
Sanford	1	155	Alamo	2	165
North Bradley	1	155	Lacota	2	175
Beaverton	1	165	Kibble	2	175
Wise	1	165	Barron Lake	2	175
Leaton	1	165	Dailey	2	175
Mt. Pleasant	1	165	Buchanan	2	185
Herrick	1	165	Dayton	2	185
Clare	1	165	Glenwood	2	175
Galliver	1	165	Middleville	2	165
Hatton	1	165	Page	5	112
Manns Siding	1	165	Sand Creek	5	107
Harrison	1	175	To Indiana pts.		
Farwell	1	165	Auburn	3	115
Lake	1	165	Spencerville	4	115
Olivers	1	185	Gar Creek	4	115
Chase	1	185	Woodburn	4	115
Branch	1	195			

Route 1—Via N. Y. C. & St. L., Fostoria, O., N. Y. C. R. R., Toledo, O., and P. M. Ry.

Route 2—Via N. Y. C. & St. L., Fostoria, O., N. Y. C. R. R., Toledo, O., and M. C. R. R.

Route 3—Via N. Y. C. & St. L., Ft. Wayne, Ind., N. Y. C. R. R.

Route 4—Via N. Y. C. & St. L., New Haven, Ind., Wabash R. R.

Route 5—Via N. Y. C. & St. L., Leipsic, O., and D. T. & I. R. R.

27734. To establish on **gravel and sand,** carloads (See Note 3), from Lamar, Wyoming, Beverly and Grand Rapids, Mich., to New Buffalo, Mich., rate of 85c per net ton. Present rate, $1 per net ton.

27742. To establish on **crushed stone,** carloads (See Note 3), from Whitehouse, O. (rates in cents per net ton). Route—Via Wabash Ry. direct.

To	Prop.	Pres.
Montpelier, O.	90	99
Edon, O.	95	108
Hamilton, Ind.	95	115
Steubenville, Ind.	100	115
Ashley-Hudson, Ind.	100	115
Holmer, Ind.	100	115
Stroh, Ind.	105	115
South Milford, Ind.	105	115
Wolcottville, Ind.	105	115
Eddy, Ind.	105	120
Topeka, Ind.	105	120
Stony Creek, Ind.	105	120
Millersburg, Ind.	105	120
Benton, Ind.	110	125
New Paris, Ind.	110	125
Foraker, Ind	110	125
Wakarusa, Ind.	115	126
Wyatt, Ind.	115	130
Lakeville, Ind.	115	135

27743. To establish on **sand and gravel,** carloads (See Note 3), to Petersburg, Ind., rate of 95c from Allison Branch, Ill., and 90c per net ton from Vincennes, Ind. Present rate, 98c per net ton.

27744. To establish on **sand and gravel,** carloads, in open-top cars (See Note 3), from Ft. Jefferson, O., to Van Wert, O., rate of 60c per net ton, to expire November 30, 1931. Present rate, 70c per net ton.

27758. To establish on **stone, crushed,** carloads, minimum weight when loaded in open cars will be 90,000 lb., except when for carrier's convenience a car of less capacity is furnished, **in which event** the minimum weight will be the marked capacity of the car used, from Peebles, O. (in cents per ton of 2000 lb.):

To	Prop.	Pres.
Bethel, O.	125	161½
Felicity, O.	130	171½
Georgetown, O.	130	171½
Russellville, O.	130	171½

27759. To establish on **sand and gravel,** carloads (See Note 3), from Dayton, O., to Lafayette, O. rate of $1 per net ton. Route—Via B. & O., Lima, O., and Penn. Ry. Present rate, $1.40 per net ton.

27761. To establish on **crushed stone and crushed stone screenings,** etc., carloads (See Note 3), from Kokomo, Ind., to Chase, Ind., rate of 90c per ton. Route—Via N. Y. C. & St. L. R. R. direct. Present rate, 99c per ton.

TRUNK LINE ASSOCIATION DOCKET

25634. To cancel the carload commodity rates on **crushed stone** from Savage Factory, Dickerson, Ellicott City, Hollofield Station, Woodstock, Marriottsville, Lime Kiln, Buckeystown, Md., and Kearneysville, W. Va., published in B. & O. R. R. I. C. C. 18236 applicable to Maryland and Penn. R. R. stations; B. & O. R. R. I. C. C. 20732, applicable to B. & O. R. R., P. R. R., etc.; B. & O. R. R. I. C. C. 21285, applicable to B. & O. R. R. and Monongahela Ry.; B. & O. R. R. I. C. C. 21907, applicable to Southern Ry. and W. & O. D. Ry.; B. & O. R. R. F. T. 1922, applicable between B. & O. R. R. stations in West Virginia. Agent Curlett's I. C. C. A265, applicable to G. F. A. territory, and all other issues now carrying rates on crushed stone from these points.

25646. **Dolomite, roasted,** carloads, from Millville and Martinsburg, W. Va., to Buffalo, N. Y., $2.24 per net ton. (Present rate, $3.40 per net ton.) Reason—Proposed rate is comparable with rate from Bainbridge, Penn.

25647. **Lime,** other than agricultural, chemical or land, carloads, minimum weight 30,000 lb., from Toms Brook, Fishers Hill, Strasburg, Strasburg Junction, Riverton, Front Royal, Happy Creek, Water Lick, Woodstock, Linville and Zirkle, Va., to New York, N. Y. (L. V. R. R.), $3.67 per net ton. Reason—Proposed rate is comparable with rate for C. N. J. and P. R. R. deliveries.

25652. **Talc or soapstone,** carloads, minimum weight 30,000 lb., from Madoc, Ont., to Albany, N. Y., 30c; Auburn, Binghamton, Minetto, N. Y., 24c; Newburgh, 31½c; Newark, N. Y., 27c; Oswego, N. Y., 24c, and Troy, N. Y., 30c per 100 lb. Reason—Proposed rates are comparable with rates to other points in Trunk Line territory now covered in C. N. Ry. Tariff E339.

25664. **Cement, common, hydraulic, natural or portland,** carloads, minimum weight 50,000 lb., but not less than 40,000 lb., from Portland Point, N. Y., to stations on the Hudson Division of the N. Y. C. R. R., Castleton-on-Hudson to Yonkers, N. Y., inclusive. Rates ranging from 15½c to 17c per 100 lb., and to Sixth St., New York, N. Y., *16½c per 100 lb.

*Issued to meet short-line competition.

25666. **Gravel and sand** (other than blast, engine, foundry, glass, molding or silica), carloads (See Note 2), from Portland, Penn., to Columbia, N. J., 45c per net ton. (Present rate, 60c per net ton.) Reason—To meet motor truck competition.

25667. **Sand,** carloads, other than blast, foundry, engine, molding, etc., **and gravel,** carloads (See Note 2), from Kenvil, N. J., to the following points in Pennsylvania (rates in cents per net ton):

To	Prop.	To	Prop.
Schuylkill Haven	160	Andreas	145
Pottsville	160	Shenandoah	170
Weatherly	160	Ashland	180
Hazleton	160		

Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

25668. **Slag,** carloads (See Note 2).

To	From Bethlehem, Penn. Prop.	From Catasauqua and Hokendauqua, Penn. Prop.
Easton, Mass.	$3.05	$3.05
North Easton, Mass.	3.05	3.05
South Stoughton, Mass.	3.05	3.05
North Stoughton, Mass.	3.05	3.05
Randolph, Mass.	3.05	3.05
North Dighton, Mass.	3.05	3.05
Dighton, Mass.	3.05	3.05
Somerset, Mass.	2.95	3.05
Fall River, Mass.	2.95	3.05
Assonet, Mass.	3.05	3.05
Tiverton, R. I.	3.05	3.05
Bristol Ferry, R. I.	3.05	3.05

Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

25669. **Sand and gravel,** other than blast, engine, foundry, glass, molding or silica, carloads (See Note 2), from Alfred, N. Y., to N. Y. & P. Ry. stations, Bennetts, Paynesville, Ellisburg, Clara, Myrtle, Penn., and various. Rates ranging from 90c to $1.20 per net ton. Reason—Proposed rates are comparable with rates to Moraine, Bolivar, N. Y., etc.

25670. **Stone, crushed or quarry broken,** carloads (See Note 2), from Jamesville, N. Y., to N. Y. O. & W. Ry. stations, Cornwall, Burnside, Spring Glen, Kingston, Wurtsboro, Monticello, Liberty, Cooks Falls, Trout Brook, N. Y., and various. Rates ranging from $1.60 to $2 per net ton. Reason—Proposed rates are comparable with rates to Oxford, Maywood, Cadosia, East Branch, N. Y., etc.

25687. **Ground limestone,** carloads, minimum weight 50,000 lb., from Bellefonte and Pleasant Gap, Penn., to Shinneton and Monongah, W. Va., 12½c per 100 lb. (Present rate, 25½c per 100 lb., sixth class.) Reason—Rate comparable with others for like distances.

25697. **Slag,** carloads (See Note 2), from Catasauqua, Penn., to Audenried, Penn., 90c per net ton. (Present rate, $1.15 per net ton.) Reason—Proposed rate is comparable with rates to Treskow, White Haven and Lehigh Gap, Penn.

25699. **Unburned ground limestone,** carloads, minimum weight 50,000 lb., from Natural Bridge, N. Y., to Slate Hill, Johnson, Westtown, Waterloo and Unionville, N. Y., 19c per 100 lb. (Present rate, combination.) Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

25704. To revise the rates on **cement,** from Lehigh and Hudson districts to stations on D. & H. R. R., Rupert, Vt., to Whitehall, N. Y. Rates ranging from 9c to 18c per 100 lb. Statement of present and proposed rates will be furnished upon request.

25713. **Lime,** carloads, minimum weight 30,000 lb., from Gouverneur, N. Y., to Edwards, N. Y., 2½c per 100 lb. (will only apply on traffic coming from beyond Gouverneur, N. Y.). Reason—Proposed rate is comparable with rates on bags, belting and copper wire between same points.

25714. **Stone (natural), crushed, coated or not coated with oil, tar or asphaltum,** carloads (See Note 2), from Utica, N. Y., to all stations on the D. & N. R. R., $1.90 per net ton. Reason—Proposed rate is comparable with rate from Munns, N. Y., to same points.

25731. **Limestone, ground,** carloads, minimum weight 50,000 lb., from Munns, N. Y., to Bridgewater, River Forks, Leonardsville, West Edmeston, Sweet and South Edmeston, N. Y., $1.30 per net ton. Present rate, $1.60 per net ton. Reason—Proposed rate is comparable with rate from Jordanville, N. Y., to U. V. Ry. stations.

25734. **Sand and gravel,** other than blast, engine, foundry, glass, molding or silica, carloads, and **crushed stone,** carloads (See Note 2), from Susquehanna, Penn., to Erie R. R. stations, Johnson City, Owego, Chemung, Corning, Painted Post, Gulf Summit, Deposit, Stockport, Callicoon, Narrowsburg, N. Y., and various. Rates ranging from 60c to $1.20 per net ton. Reason—Proposed rates are fairly comparable with rates on like commodities for like distances, services and conditions.

25667. **Sand,** carloads, other than blast, foundry, engine, molding, etc., and **gravel,** carloads (See Note 2), from Succasunna, N. J., to Pennsylvania points:

To	Prop.	To	Prop.
Andreas	$1.45	Hazleton	1.60
Schuylkill Haven	1.60	Shenandoah	1.70
Pottsville, 12th St.	1.60	Ashland	1.80
Weatherly	1.60		

25746. **Crushed stone,** carloads (See Note 2), from Easton (Bushkill Station), Penn., to Scranton, Penn., $1.50 per net ton. Present rate, $2.05 per net ton. Reason—Proposed rate on basis of Birdsboro Stone Scale, I. C. C. 9532.

25748. **Crushed stone and articles taking same rates,** carloads (See Note 2), from Le Roy and Lime Rock, N. Y., to Coudersport, Penn., $1.50 per net ton. (Present rate, $1.60 per net ton.) Reason—Proposed rate is made favorable with rate from Le Roy, N. Y., to Gold and Seven Bridges, Penn.

25756. **Sand,** carloads, (A) in open-top cars; (B) in box cars or closed equipment (See Note 2), from Raritan River R. R. points:

To	Prop. rates (A)	(B)
Birdsboro, Penn.	165	185
Chambersburg, Penn.	275	310
Downingtown, Penn.	165	190
Frederick, Md.	255	280
Hagerstown, Md.	275	310
Harrisburg, Penn.	220	240
Reading, Penn.	175	185
Kennett Square, Penn.	205	230
Shippensburg, Penn.	275	310
Waynesboro, Penn.	275	310
Wilmington, Del.	165	190

The above rates in cents per 2000 lb.

Reason—Proposed rates are comparable with rates from Cape May, N. J.

25757. **Feldspar,** carloads, minimum weight 60,000 lb., from Brookneal, Va., to Cameron, Clarksburg, Elm Grove, Fairmont, Grafton, Keyser, Mannington, Morgantown, Sabraton, Shinnston, Star City, W. Va., and Washington, Penn., $4.68 per net ton. Reason—Proposed rates are comparable with rates from Erwin, Tenn., and Rochester, N. Y.

25758. **Sand,** in open-top cars, carloads (See Note 2), from Tatesville, Penn., to P. R. R. points, Irvona, Fordham, Patton, Hooverhurst, Jeanette, Josephine, End of Martin Branch, Ashtola, Johnstown, Bessemer, Pittsburgh Stations, Connellsville, Uniontown, Penn., and various. Rates ranging from $1.20 to $1.70 per net ton. Reason—Proposed rates are fairly comparable with rates from Brumbaugh, Penn.

25759. **Sand** (other than blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica) and **gravel,** in straight or mixed carloads, in open-top equipment (See Note 2), from Rochester, N. Y., to Scottsville, Cuylerville, Sonyea, Nunda, Caneadea, Olean, Allegany, Struthers, Machias, Chaffee, N. Y., and various. Rates ranging from 75c to $1.60 per net ton. Reason—Proposed rates are comparable with rates on crushed stone from and to same points.

M-1640. Establish rates on **cement,** carloads, from all producing points in Trunk Line territory, including New Castle, Penn., district, to stations on the Winchester and Wardensville R. R., on basis of 2c per 100 lb. in excess of the scale in I. C. C. Docket 15806.

25767, Sup. 3. **Sand and gravel,** carloads (See Note 2), from Raritan River R. R. points to Beauharnois, Que., 24c per 100 lb.

26078. **Sand, common building (not blast, engine, fire, foundry, glass, molding or silica),** carloads, from McConnellsville, N. Y., to St. Johns.

Que., 14½c per 100 lb. Reason—Proposed rate is comparable with rates from Humaston and Rome, N. Y., to Montreal, Que.

26079. **Crushed stone,** carloads (See Note 2), from Port Richmond (Philadelphia), Penn., to Folsom, N. J., 70c per net ton. (Present rate, $1.05 per net ton.) Reason—To meet motor truck competition.

26088. **Stone, natural** (other than bituminous asphalt rock), **crushed,** and **stone, crushed,** coated with oil, tar or asphaltum, carloads (See Note 2), from Norfolk, N. Y., to N. Y. C. R. R. points, Watertown, Chaumont, Cape Vincent, Great Bend, Carthage, Harrisville, Newton Falls, Deer River, Lowville, Boonville, Clayton, Keenes, Edwards, Richville, Canton, Potsdam, Massena, N. Y., and various, rates ranging from 80c to $1.50 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions within the same general territory.

26089. **Stone (natural), crushed or broken,** uncoated or coated with tar, asphaltum or oil, carloads (See Note 2), from Oriskany Falls, N. Y., to N. Y. C. and W. S. R. R. stations, Schenectady, Fonda, Little Falls, Salisbury Centre, Herkimer, Oriskany, Syracuse, Jordan, Lyons, Rochester, Richland, Humaston, Watertown, Black River, Lowville, Hinckley, Beaver River, Tupper Lake, South Amsterdam, Frankfort, Vernon, Georgetown, Wayneport and various, rates ranging from 90c to $1.60 per net ton. Reason—Proposed rates compare favorably with rates from Jamesville, N. Y.

26091. **Sand and gravel,** other than blast, engine, foundry, glass, molding and silica, carloads (See Note 2), from Alfred, N. Y., to Cohocton, Atlanta, Wayland, N. Y., $1, and Hammondsport, N. Y., $1.20 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

26092. **Sand, common,** carloads (See Note 2), from Palermo, N. J., to Folsom, N. J., 50c per net ton. (Present rate, 15½c per 100 lb.) Reason—To meet motor truck competition.

26109. **Grinding sand,** carloads, loaded in open-top cars (See Note 2), from Butler, Penn., to Renfrew, Penn., 60c per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

26115. **Sand and gravel,** other than blast, engine, foundry, glass, molding and silica, carloads, and **crushed stone,** carloads (See Note 2), from Alfred, N. Y., to Bulls Mill, Eldred, Penn., $1.20, and Port Allegany, Wrights, Liberty and Keating Summit, Penn., $1.30 per net ton. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

26117. To revise Items Nos. 3690, 3695, 3700 and 3705 of Agent Curlett's I. C. C. No. A265, covering rates on **limestone,** to provide for minimum weight of 60,000 lb., in connection with the following rates:

ITEM No. 3690

	Monongahela Ry.	Rate
58195	Brownsville, Penn.,	
	to	
58425	Van Zandt, Penn.	10
58500	Jct. Ten Mile Run Branch	
	to	
58514	Nemacolin, Penn.	10

ITEMS Nos. 3695, 3700 and 3705
B. & O. R. R.

2495	McKeesport	
	to	
2725	Etna, Penn.	10
2730	Wittmer	
	to	
2815	Renfrew, Penn.	11
	Butler, Penn.	11
2825	Carbon Centre	
	to	
3100	Mt. Jewett, Penn.	11
3105	Evans City	
	to	
3150	Rock Point, Penn.	11
	B. & L. E. R. R.	
7835	Butler	
	to	
7930	North Bessemer	11
	Montour R. R.	
58605	Storage	
	to	
58745	Mifflin Jct., Penn.	10
	P. & L. E. R. R.	
75730	Rock Point	
	to	
75830	Coraopolis, Penn.	11
75835	Montour Jct.	
	to	
76235	Brownsville, Penn.	10
	P. & W. Va. Ry.	
76405	West End	
	to	
76655	Bruceton, Penn.	10
76700	McKees Rocks	
	to	
76780	Neville Island, Penn.	11

Reason—To eliminate Fourth Section departures.

26121 **Ganister stone,** carloads (See Note 2), from Madley, Penn., to Aliquippa, Penn., $1.76 per net ton. (Present rate, $1.90 per net ton.) Reason—Proposed rate is fairly comparable with rates to Pittsburgh, Penn., and Youngstown, O.

26122. **Sand** (other than blast, engine, glass, molding or foundry, quartz, silex and silica) **and gravel,** carloads (See Note 2), from Bowie Road, Md., to B. & O. R. R. stations, Philadelphia, Penn., Havre de Grace, Brunswick, Md., Terra Cotta, Georgetown, D. C., Hancock, Summit Point, Green Spring, W. Va., Vaucluse, Strasburg, Va., and various, rates ranging from $1 to $1.60 per net ton. Reason—Proposed rate is comparable with rate on like commodities for like distances, services and conditions.

26148. To change route on **sand,** carloads, from Hancock-Berkeley Springs, W. Va., to Pittsburgh, Penn., for P. R. R. delivery from B. & O., Bessemer, P. R. R. to B. & O., Everson, Penn., P. R. R. Reason—On account of no working arrangements via the B. & O., Bessemer, P. R. R. route.

26158. To amend description now carried in B. & O. R. R. Tariff P. S. C. W.Va. 3244, applying on **sand** (other than blast, engine, foundry, glass, molding or loam), carloads, **and gravel, crushed stone and slag,** carloads (See Note 2), from and to stations on the B. & O. R. R. as indicated in tariff, to read: "Sand (other than blast, engine, foundry, glass, molding or loam), gravel, crushed stone and slag, carloads, in open-top cars without tarpaulin or other protective covering (See Note 3)." Reason—Restriction as to loading of sand in open-top cars without tarpaulin or other protective covering is applicable at present in connection with Pennsylvania intrastate rates on sand.

26159. **Sand, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), from Tatesville, Penn., to Madera, Spangler, Barnesboro, Penn., $1.89, and Sheffield, Penn., $2.25, and Melcroft, Penn., $1.85 per net ton. Reason—Proposed rates are comparable with rates from Mapleton district.

26161. **Gravel and sand,** N. O. I. B. N. in O. C., except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), from Netcong and Succasunna, N. J., to Wilkes-Barre, South Wilkes-Barre, Buttonwood, Sugar Notch, Ashley and Wanamie, Penn., $1.50 per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

26168. **Sand, molding,** carloads (See Note 2), from:

N. Y. C. R. R.—Rensselaer, N. Y., Albany, N. Y., Troy, N. Y., Green Island, N. Y., Cohoes, N. Y., Crescent, N. Y., Niskayuna, N. Y., Aqueduct, N. Y., West Albany, N. Y., Karner, N. Y., Schenectady, N. Y.

W. S. R. R.—Selkirk, N. Y., Wemple, N. Y., Glenmont, N. Y., South Schenectady, N. Y.

To Tweed, Ont., 17½c per 100 lb. Present rate, sixth class. Reason—Proposed rates are fairly comparable with rates from Albany, N. Y., to Ottawa, Brockville and Tweed, Ont.

26169. (a) **Stone, natural** (other than bituminous asphalt rock), **crushed;** and (b) **stone, natural** (other than bituminous asphalt rock), **crushed, coated with tar or asphaltum,** carloads (See Note 2), from South Bethlehem, N. Y., to Delanson, N. Y., (a) $1.10 and (b) $1.20 per net ton. Reason—Proposed rates are comparable with rates from South Amsterdam, N. Y.

26175. **Stone, crushed or broken, and stone screenings,** carloads (See Note 2), from Bittinger, Thomasville and York, Penn., to New Windsor and Union Bridge, Md., 80c per net ton, rate to expire December 31, 1931. Reason—To meet motor truck competition.

26179. **Crushed stone,** carloads (See Note 2), from Group 1, Grove, Frederick, Security, Md., Engle, Martinsburg, Millville, W. Va., and Group 2, Stephens City and Strasburg Jct., Va., to R. F. & P. R. R. stations Seminary, Quantico, Fredericksburg, Penola, Ashland, Glen Allen, Va., and various, Group 1 rates ranging from $1.40 to $1.70; Group 2 rates ranging from $1.50 to $1.75 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

26182. **Sand** (other than blast, engine, foundry, glass, loam, molding or silica), carloads, **and gravel, also crushed stone,** carloads (See Note 2), from Cumberland, Md., to points in West Virginia, Patterson Creek, Durgon, Glebe, Romney, Millen, Green Springs, Paw Paw, Great Cacapon, Berkeley Springs, Halltown, Charlestown, Martinsburg, Duffields, Aldridge, Harpers Ferry, Summit Point, W. Va., and various, rates ranging from 60c to $1.20 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

26184. **Phosphate rock** (super-phosphate), carloads, minimum weight 40,000 lb., from Carteret, Elizabeth, Perth Amboy and Jersey City, to Alton, N. Y., 16c per 100 lb. (Present rate, 25c per 100 lb., sixth class.) Reason—Proposed rates same as now in effect from Carteret, N. J., to Buffalo, Rochester, Oswego, N. Y., etc.

26186. **Agricultural and ground limestone,** carloads, minimum weight 60,000 lb., from Annville, Myerstown, Palmyra and Swatara, Penn., to Reading county stations, Tamaqua, Winfield, Bloomsburg, Newberry, Lemoyne, Bowmansdale, Barnitz, Shippensburg, Biglerville, Gettysburg, Penn., and various, rates ranging from $1.20 to $1.80 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions within the same general territory.

26187. **Stone, natural** (other than bituminous asphalt rock), **crushed; stone, coated with oil, tar or asphaltum,** carloads (See Note 2), from Norfolk, N. Y., to Rutland R. R. stations, rates ranging from 80c to $2.10 per net ton, and to N. Y. C. R. R. stations, Nyando, Brandon, Tupper Lake, Saranac Lake, Morgan, Mountain View, Constable, N. Y., and various, rates ranging from $1 to $1.30 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

M-1692. **Screenings, crushed stone; crushed stone; tailings, crushed stone,** carloads (See Note 2), from Lime Rock to Rochester, N. Y., 65c per net ton. (Present rate, 75c per net ton.) Reason—To meet motor truck competition.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

21945. **Dolomite or fluxing stone** (See Note 2), from Redding, Conn., to various points on the N. Y. N. H. & H. R. R. now shown as destinations in Items 480 to 590, inclusive, in N. Y. N. H. & H. R. R. I. C. C. F3021. Present—Sixth class as published in N. Y. N. H. & H. R. R. I. C. C. F2424. Proposed—Same basis of rates as now in effect from other shipping points published in N. Y. N. H. & H. R. R. I. C. C. F3021 covered by N. E. F. A. Proposal 15736. Reason—To provide rates from a new industry at Redding, Conn., on the same basis as those from producing points.

22000. **Crushed stone** (trap rock), from Westfield, Mass., to Huntington, Mass. Present rate, 60c; proposed, 45c per net ton. Reason—To meet motor truck competition.

21886. **Stone, broken or crushed,** in gondola or other open cars (See Note 3), from Meriden and Meriden (York Hill Quarry), Conn., to North Windham, Conn. Present rate, $1 per net ton; proposed, 85c. Reason—To meet motor truck competition.

22019. **Sand, common** (not molding, fire, filter or blasting) or **gravel,** in straight or mixed carloads, from North Wilbraham, Mass., to Rensselaer, N. Y. Present rate, 6½c; proposed, $1 net ton. Reason—Necessary to meet barge competition.

21582. **Stone, broken or crushed,** in bulk, in gondola or other open-top cars (See Note 3), from Trumbull, Conn., to Cornwall Bridge, Conn. Present rate, $1.05; proposed, 85c per net ton. Reason—To meet local competition.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4231-C. **Dolomte, burnt or roasted,** carloads, minimum weight 60,000 lb., from East St. Louis and Granite City, Ill., to Peoria, Ill. Present rate, $2.10; proposed, $1.76 per net ton.

4883-E. **Sand, blast, engine, foundry, glass and molding,** carloads (See Note 1), from Bowes, Ill., to De Kalb, Ill. Present rate, $1.39; proposed, $1.25 per net ton.

6052. **Rip rap,** carloads, from Valley City, Ill., to Beardstown, Ill. Present rate, class; proposed, $1.13 per net ton.

6066. **Agricultural limestone,** carloads, minimum weight 60,000 lb., from Dubuque, Ia., to C. & N. W. Ry. stations, viz., Union Grove, Morrison, Nelson, Dixon, Ashton, Creston, etc., Ill. Present rate, $1.23; proposed, 93c per net ton.

3240-B. **Stone, crushed,** carloads (See Note 1), but not less than 40,000 lb., from Joliet, Ill., to C. R. I. & P. Ry. stations, Peru, Spring Valley, Marquette and DePue, Ill. Rates per net ton. Present rate, 88c; proposed, 76c.

WESTERN TRUNK LINE DOCKET

6800-D. **Sand, blast, engine, foundry, glass and molding** (See Note 1), from Bowes, Ill., to Kansas City, Mo., St. Joseph, Mo., Atchison, Leavenworth, Ft. Leavenworth, Kan., and Omaha, Neb. Present rate, class; proposed, $2.95 per ton of 2000 lb.

7549. **Stone, crushed, coated with oil,** tar or **asphaltum,** carloads (See Note 3), from Des Moines, Ia., to destinations in Illinois, Nebraska, Kansas, Missouri, Minnesota, North and South Dakota. Rates: Present, Class "D" rates to Illinois, Nebraska, Kansas, Minnesota, North Dakota for both single and joint line application and to Minnesota, Missouri and South Dakota for joint line application; to Minnesota, Missouri and South Dakota for single line application, the distance scale of rates herein proposed, is in effect. Proposed, for joint line application the following rates plus 30c per ton of 2000 lb. will apply. Rates in cents per ton of 2,000 lb.:

Distances	Single line
10 miles and under	96
25 miles and over 10 miles	96
40 miles and over 25 miles	107
60 miles and over 40 miles	119
75 miles and over 60 miles	130
100 miles and over 75 miles	142
125 miles and over 100 miles	153
150 miles and over 125 miles	176
175 miles and over 150 miles	188
200 miles and over 175 miles	199
225 miles and over 200 miles	211
250 miles and over 225 miles	222
275 miles and over 250 miles	234
300 miles and over 275 miles	257
325 miles and over 300 miles	268
350 miles and over 325 miles	280
375 miles and over 350 miles	291
400 miles and over 375 miles	303

2051-PP. **Stone, crushed,** carloads (See Note 3), but not less than 40,000 lb., from Jasper, Pipestone, Quartzite, Minn., and Sioux Falls, S. D.

Present rates to Mt. Pleasant, Ia., Albia, Ia., Chariton, Ia., Creston, Ia., St. Charles, Ia., combination rates.

Proposed rates to Mt. Pleasant, Ia., Albia, Ia., 11c; Chariton, Ia., Creston Ia., St. Charles, Ia., 12c.

And intermediate points and branches on the C. B. & Q.

2030-D. **Amiesite (asphalt coated crushed stone),** (See Note 1), but not less than 50,000 lb., from Ft. Scott, Kan., to St. Louis, Mo., Peoria, Ill., Chicago, Ill., and St. Paul, Minn., groups. Rates: Present—Class rates via St. Louis, Mo., 16½c Peoria group, 19½c Chicago, Ill., group, 20½c St. Paul group, via Kansas City, Mo. Proposed—To add Ft. Scott, Kan., as origin point in Items 3560 and 3565 of W. T. L. Tariff 18M.

6729-C. **Sand,** carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Chippewa Falls, Wis., to Herington, Kan. Present rate, 39c (class E); proposed, 29½c.

I. C. C. Proposed Reports

23068. Limestone. Use of the Pennsylvania intrastate rate scale on ground limestone for the removal of undue prejudice to a point in Pennsylvania that can ship only through a part of Ohio has been recommended by Examiner Morris H. Konigsberg in No. 23068, New Castle Lime and Stone Co. et al. vs. Aliquippa and Southern et al. The examiner said that the Interstate Commerce Commission should find the maintenance of intrastate rates on ground limestone between points in Pennsylvania which were lower, distance considered, than the rates from Shaw Junction, Penn., where the complaining corporations have their plants, to destinations in Pennsylvania covered by the complaint, unduly prejudicial to the complainants and unduly preferential of complainants' competitors at Pennsylvania producing points. He said the commission should find that the undue prejudice should be removed by the establishment of rates from Shaw Junction to destinations in Pennsylvania not in excess of those applicable from Pennsylvania producing points to destinations in Pennsylvania. He said the commission should further find that the complainants had not made proof of damages such as was required to support an award of reparation under the findings proposed by him.

The complaint alleged that the rates from Shaw Junction to points in Pennsylvania, New York, Maryland and West Virginia were unreasonable, unduly prejudicial to the complainants and unduly preferential of competitors located in Bellefonte, Penn., Buffalo, N. Y., Gibsonburg and Marble Cliff, Ohio, and Martinsburg and Greer, W. Va.

17000. Sand, gravel and crushed stone. A re-making of the rates on road-making materials and on silica or glass sand in a considerable part of southwestern territory has been recommended by Examiner E. H. Waters in No. 17000, part 11-A, Hoch-Smith rates on sand, gravel and crushed stone from and to points in Kansas and Missouri. Silica sand was put into this proceeding for further hearing. It is a part of No. 17000, part 11, the main Hoch-Smith sand and gravel case. Examiner Waters recommends the use of scales for the making of rates on the two sorts of commodities covered by his report.

This case was heard co-operatively with the commissions of Missouri, Kansas, Arkansas, Oklahoma and Texas. The scales proposed by Examiner Waters are for interstate application. The examiner said that in view of the fact that the state commissions had participated in the hearings it was not deemed by him necessary to recommend any findings concerning the intrastate rate situation as a whole in its relation to the interstate bases as put in issue in this proceeding. He said that that was so because it was felt that the state commissions would co-operate in authorizing such revision or revisions of the state rates as might be found necessary to bring state rates into harmony with whatever interstate adjustment was finally approved in this case.

At the suggestion of the Missouri commission this inquiry was as to the lawfulness of the rates and charges on interstate movements of sand, gravel, crushed stone, chat and related commodities taking the same rates, between points in Missouri and between points in Kansas, and between points in Missouri and Kansas; the interstate rates between points in Missouri and Kansas on the one hand and points in Oklahoma and Arkansas on the other; and the relation between the interstate rates mentioned and the intrastate rates applying between points within Missouri and Kansas.

When the commission decided to act upon the Missouri suggestion it dubbed that part of the case as No. 17000, part 11-A, of the Hoch-Smith proceeding. The main part of the Hoch-Smith sand and gravel case was disposed of in sand, gravel, crushed stone and shells, 155 I. C. C. 247. Rates therein prescribed usually referred to as southwestern sand and gravel rates, became effective, except as to rates on silica sand, about October 17, 1929.

According to Examiner Waters at least seven different scales were proposed by different interests for application within the territory involved, including one known as the composite scale, the latter founded on 90% of the scale prescribed in the main proceeding and adding thereto 40% of the arbitraries prescribed for joint-line hauls, the product being called a scale for general use. Kansas presented that scale. Addition of 40% of the joint-line arbitraries was based on the fact that about 40% of the hauls in Kansas were joint-line. Examiner Waters proposed disposition of the matters in accordance with the following recommendations.

That the interstate rates between points in Missouri, between points in Kansas and between points in Missouri and Kansas, and between points in those states on the one hand and points in Oklahoma and Arkansas on the other be found unreasonable to the extent they exceed or may exceed rates set forth in Appendix 2 (not herein reproduced) with exceptions shown in the other recommendations.

That the interstate rates on crushed stone from McDowell, Birmingham, Atwood's quarry, Pixleys, Melville and Morris (without the Kansas City switching district), and from points within the switching district, to industrial and team tracks within the Kansas City, Mo.-Kan., switching district, are and will be unreasonable to the extent they exceed or may exceed 50 cents a net ton; that the interstate rates from the same points to destinations in Kansas and Missouri are and will be unreasonable to the extent they exceed or may exceed rates made in accordance with the basic scale in Appendix 2; that the service accorded by the Santa Fe in transporting crushed stone from the quarry at Sugar Creek, Mo., to Big Blue Junction in connection with interstate transportation to points in Kansas and Missouri outside of the Kansas City switching district is a switching service and that a reasonable charge would not exceed $10 a car; that the service accorded from and beyond Big Blue Junction is a line-haul service. That finding also contains additional indications as to how services in and around the points mentioned shall be treated in the making of rates.

That the interstate rates on sand from Muncie and Grinter, on sand and gravel from Holliday, and on sand from producing points within the Kansas City switching district, to industrial and team track deliveries within the two-state switching district shall not exceed 50 cents a net ton and that to points outside the switching district the rates shall be computed in accordance with the basic scale.

That the basic scale shall be used in making rates on sand and crushed stone from producing points in and without the switching district of Tulsa, Okla.

That the maximum reasonable rates, interstate, on silica or glass sand, in box cars, between points in Arkansas, Oklahoma, Texas and western Louisiana, and between points in Missouri, between points in Kansas, between points in Missouri and Kansas, and between points in Missouri and Kansas, on the one hand, and points in Oklahoma and Arkansas, on the other, will be rates not in excess of those set forth in Appendix 3 (not herein reproduced); and that the reasonable maximum interstate rates on such sand, in open-top cars, will be rates not in excess of those made by the use of the scale in Appendix 2, the basic scale for ordinary sand and gravel also carried in open-top cars.

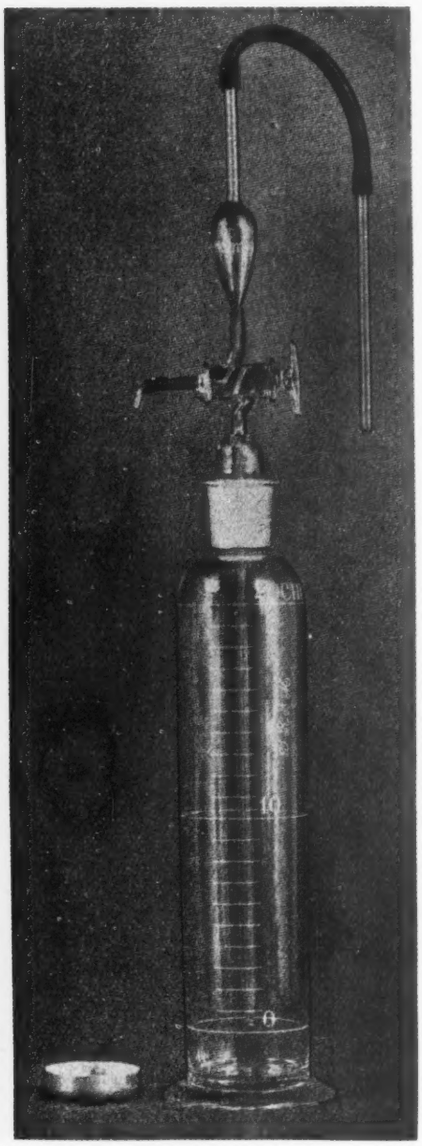
Additional findings recommend that 90% of the marked capacity of the cars be the minimum carload and that distances be computed over lines that can be used in the interchange of freight without transfer of lading.

The scale prescribed in Appendix 1 provides for different rates for single and joint line hauls up to the block between 440 and 470 miles. In the block between 470 and 500 miles they become the same for both joint-line and single-line hauls. That scale begins with a rate of 50 cents a ton for single and 65 cents a ton for joint-line hauls for 10 miles and under. It becomes 100 cents for single and 115 cents for joint-line hauls at 100 miles; 150 and 160 cents at 200 miles; 190 and 200 cents at 320 miles; 220 and 225 cents at 410 miles; 250 cents at 500 miles; 290 cents at 620 miles; 320 cents at 710 miles, and 450 cents at 800 miles.

The scale to be used for the making of rates on silica sand in box cars, Appendix 3, begins with 64 cents a ton for hauls of 10 miles and under; becomes 130 cents at 100 miles; 183 cents at 200 miles; 230 cents at 320 miles; 263 cents at 410 miles; 292 cents at 500 miles; 324 cents at 620 miles; 348 cents at 710 miles; 372 cents at 800 miles; 395 cents at 900 miles, and 415 cents at 1,000 miles.

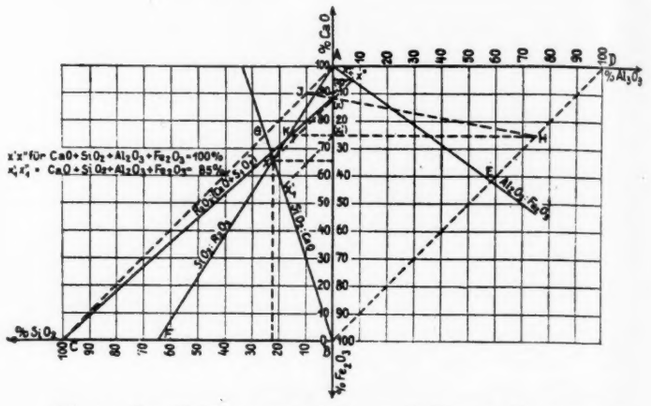
Foreign Abstracts and Patent Review

Analysis of Cement Sedimentation. A. H. M. Andreasen has developed, upon the basis of his previous investigations, a special sedimentation apparatus for analysis in the plant, of the granulation and distribution of the constituents of mortar materials. This apparatus can be used for mortar materials only after the correct dispersion medium has been provided, that is, a liquid which (1) does not affect the material chemically; (2) can produce a coagulation-free suspension of the material when using a peptisator; (3) has a viscosity adjusted to the measuring range which affects the mortar materials, that is, the granulation range from 100 to 5 microns (μ). Aethylenglycol, which has a viscosity of 0.214 and a specific gravity of 1.112 at 20 deg. C., used as a cooling liquid in automobiles and available in pure state and at a low price, was used as the dispersion medium in analyzing a number of mortar materials with the sedimentation apparatus.



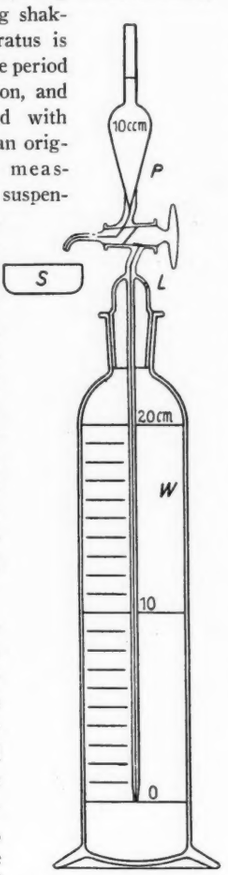
Special sedimentation apparatus

This apparatus is shown in the photos. It consists of the cylinder *w* and a fused-on pipette *P*. Samples can be drawn continually and suspension can be maintained easily by occasional turning of the apparatus. The opening *L* permits unobstructed drawing of the liquid and this opening is held closed with the finger during shaking. Then the apparatus is set down for a definite period to permit sedimentation, and the results compared with the concentration of an original volumetrically measured homogeneous suspension. In order to avoid convection currents in the suspension due to variations in temperature, the room temperature should be kept as uniform as possible. The author goes into the details of performing the analysis and comparing the results.—*Zement* (1930) **19,** 30, pp. 698-701.



Illustrating the four-materials parallelogram for cement composition

The Four-Materials Parallelogram Reviewed. M. Spindel shows in this illustrated review how he developed the four-materials parallelogram for cement composition, what problems were and can be solved with it, and how much easier it is to work with this graphic representation than with a pure calculation. The representation of the cements in the four-materials parallelogram appears to be the most simple way thus far made known for use in comparing in a clear manner the results of cement research and cement practice. The author hopes that his review will give a further incentive to a general introduction of the four-materials parallelogram. [The article is long and involved; the accompanying illustration, however, gives a clue to the system employed.—The Editor.]—*Zement* (1930), **19,** 51, pp. 1200-1205.



Another view of apparatus for sedimentation of mortar materials

Effect of Fluctuations in Silicate Modulus Upon Kiln Output. O. Frey asks the question: "Do heavy fluctuations in the silicate modulus render it more difficult to adjust the rotary cement kiln to a uniform maximum production?" Frequently it is believed that heavy fluctuations in the silicic acid content render it very difficult to obtain maximum outputs in kiln operation, especially with rotary kilns. The following instance is a good example that this view is incorrect. The available deposit of raw material showed quite heavy fluctuations in its composition, especially in the silicate modulus of the marl. The deposit contains lean and fat layers, with a difference of 2.2 to 7.0 in the silicate modulus. Raw mixing of this material brought the silicate modulus within the limits of 3 to 3.5.

A "Unax" kiln with chains, supplied with a slurry of this raw material, produced 25% over the guaranteed output of 125 tons per day. The silicate modulus for a three-week period of examination is given in Fig. 1, and the corresponding kiln output in Fig. 2. It was observed that there was never a ring formation when the silicate modulus was from 3 to 3.5%, and it started only when the modulus dropped to less than 3.0. The clinker obtained was deep black, lustrous and of a hard quality. The cement was of a

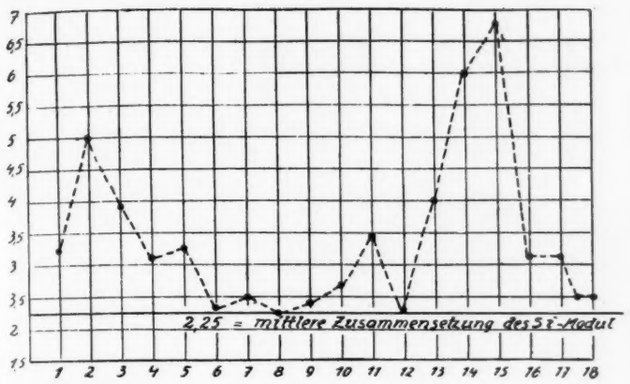


FIG. 1

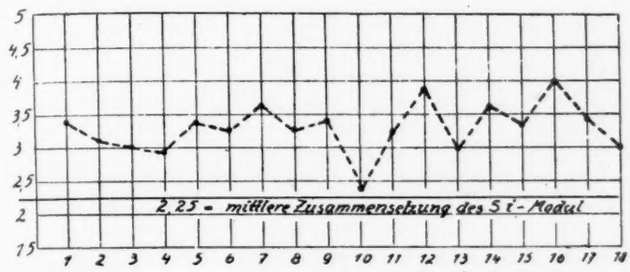


FIG. 2

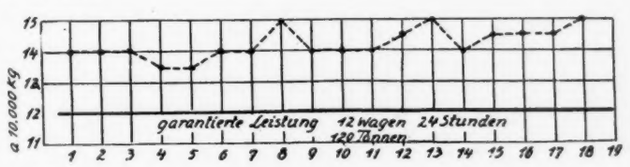


FIG. 3

Fig. 1. The silicate modulus of the marl from day to day

Fig. 2. The silicate modulus of the slurry for the three weeks (2.25 is average Si modulus)

Fig. 3. Kiln output for the period corresponding to that in Fig. 2; guaranteed output 12 carloads, 24 hours, 120 metric tons of 1000 kg. (2200 lb.)

high grade. The fuel consumption was 25 to 26% and the sintering point of the raw material 1520 to 1530 deg. C.—*Zement* (1930) **19**, 32, pp. 744-745.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Production of Magnesium Chloride. The process consists in combining chlorine, sulphur dioxide and a magnesium base (such as magnesium oxide) in the presence of water. This reaction forms magnesium chloride and magnesium sulphate, which are separated by fractional crystallization.—*Thomas Griswold and Ralph M. Hunter, assignors to the Dow Chemical Co., U. S. Patent No.* 1,756,247.

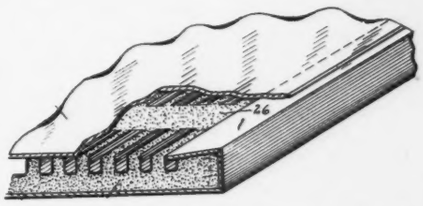
A process patent somewhat similar to the above consists of a cyclic process of making magnesium and magnesium chloride, wherein dolomite is utilized as the source of magnesium, which comprises electrolyzing magnesium chloride to produce magnesium and chlorine, reacting the chlorine with sulphur dioxide and water whereby hydrochloric and sulphuric acids are formed, removing the sulphuric acid by treating with calcium chloride and thereby forming an amount of hydrochloric acid additional to that first formed, reacting a portion of such hydrochloric acid with raw dolomite, treating the resulting solution with hydrated calcined dolomite, separating magnesium hydroxide from the solution of calcium chloride, returning the calcium chloride to the above mentioned third step, treating the magnesium hydroxide with the remaining portion of hydrochloric acid from said third step, dehydrating the magnesium chloride so formed, and returning the dried chloride to the above mentioned first step.—*Herbert H. Dow and Edwin O. Barstow, assignors to the Dow Chemical Co., U. S. Patent No.* 1,749,211.

Improved Hydraulic Cement. The patentee describes a novel method of imparting high-early-strength, good plasticity and workability to portland cement concrete. He has found that if ordinary portland cement is added to a super-saturated solution of calcium chloride (50% $CaCl_2$) with stirring, a cheese-like elastic complex mass is obtained. He states that if one volume of the calcium chloride solution is combined with an equal volume of dry portland cement, with stirring continued until the mass has "clabbered," and that if 1 to 10 parts of this product is ground with cement clinker or cement, the above favorable characteristics are imparted to the resulting concrete.—*Frederick W. Huber, U. S. Patent No.* 1,773,001.

Nitrate Fertilizer from Phosphorus Slag. The authors propose to combine phosphorus material in a blast furnace with calcium and aluminum-bearing minerals, controlling the amount of CaO in the slag so as to be between 45% and 60%; the amount of $Al_2O_3 + Fe_2O_3$ between 10% and 40%, and SiO_2 between 10% and 30%. Such slags break down to powders readily on cooling and are soluble in nitric acid. They propose to treat these slags with HNO_3 and after removing the iron and aluminum with lime concentrate the calcium nitrate to a solid condition.—*Robert Griessbach, Otto Schliephake and Otto Heusler, assignors to I. G. Farbenindustrie Aktiengesellschaft, U. S. Patent No.* 1,766,785.

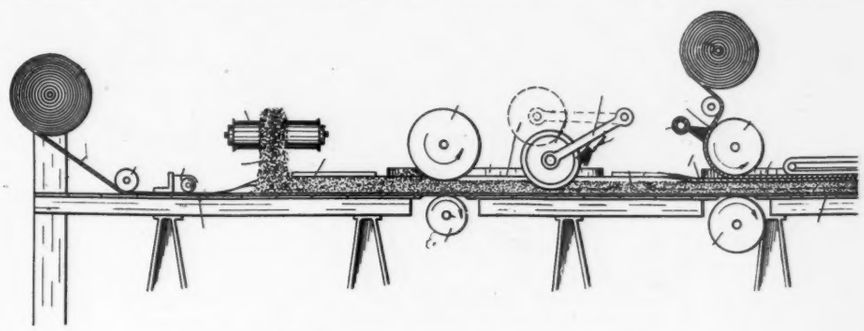
Corrugated Wallboard. The inventor describes a gypsum wallboard and also a machine for its manufacture. The wallboard differs from the ordinary variety in that one of its surfaces, is fluted before applying the top cover paper, thus providing a board of light weight and with dead air spores in the gypsum core. These two features are desirable, as they reduce the cost of the wallboard and improve its insulating properties.

The patentee describes his machine wherein the plastic material is fed to the lower



One surface of the wallboard is fluted before applying the top cover paper

paper, after which the plastic material is leveled off and passed through forming rolls and thence the board passes under the fluted roll, which may be heated if desirable. The top cover paper is treated with a sizing or with a dilute suspension of gypsum stucco and water to improve its adhesion.—*Harry E. Brookby, assignor to the United States Gypsum Co. U. S. Patent No.* 1,750,621.



Machine for the manufacture of fluted wallboard

Successful Safety Meeting at Louisville, Ky.

Cement Mills of Three States Hold Annual Conference February 12

First-aid team No. 1, Kosmos Portland Cement Co., winners of Louisville meet. Left to right, Howard Samuels, Ted Kirp, Herbert Downs, Herbert Pack, Harry Curry, John J. Jupin

MEMBER CEMENT MILLS of the Portland Cement Association, located in southern Indiana, southern Ohio and Kentucky, held their annual safety meeting at Hotel Kentucky, Louisville, on Thursday, February 12, **Stanley Owens,** safety engineer of the Portland Cement Association, acted as chairman and was assisted by a committee representing the local mills.

Mr. Owens opened the meeting with a condensed report covering accident progress in the industry as a whole and in that particular district. Figures were presented to show that in 1930 there was a reduction of 66% in the lost-time and fatal accidents suffered by plants represented at the meeting, as compared with the figures for 1929. Four mills in this group completed 1930 without accidents as compared with two mills which achieved this distinction in 1929. Representatives of the plants participating in the meeting were then called upon to present the most effective new ideas used by their respective organizations during the past year to reduce accidents. Remarks on this subject are briefly extracted as follows:

A. C. Brown (works manager, Kosmos): A great deal of improvement has been noted as a result of our efforts to promote good feeling and mutual co-operation among our employes. This effort has been noticeably effective in encouraging men to look out for others as well as themselves. Employes engaged in construction and repair work are warned particularly not to hurry, always taking time to consider and provide against hazards in advance.

W. Stroud (chief engineer, Louisville): We try by good example and leadership, to steer our men into safe habits. Our foremen understand that their safety work is just as important as taking care of the equipment and keeping it in operation. Every minor accident is regarded as a potential lost-time accident.

O. R. Cornelius (safety director, Southwestern): We try to keep interest stimulated by not letting any one program grow stale. Before interest in one kind of safety work lessens, we try to change to something else that will give the best results. Some of our most effective methods are: (1) Dividing our men into groups to stimulate competition; (2) Payment of a bonus to all departments going through the month without a lost-time accident; (3) Daily use of a current News Bulletin service including posters on accident prevention and general safety education; (4) A Safety Court—which is used in several plants and which has been very effective; (5) We try to have every man, for a period during the year, serve on an employes' safety committee, and this is producing splendid results in selling safety to our men.

J. E. Compliment (mine superintendent, Wellston): I never permit my men to work any place I have not been. They work only where I know conditions are sufficiently free from hazard to justify their presence from a safety point of view. We continually stress the importance of men looking out for others as well as themselves.

Following the individual reports the chairman introduced W. H. Weitknecht, superintendent of the Lehigh plant at Mitchell, Ind., who discussed explosions of coal and coal dust. In addition to open fires, torches, stoves and occasional poor electric wiring conditions as causes of coal dust explosions, he said that another great danger exists in the spontaneous combustion of accumulations of coal dust whenever such accumulations are permitted to remain on hot brick settings or similar hot surfaces. During dry, hot weather spontaneous combustion will occur on structural members, ledges, roof trusses, etc. Great care must be taken in removing such accumulations as careless sweeping or knocking off may result in a serious coal dust explosion. Continuing, he said:

"The careless and improper operation of coal dryers is often the cause of serious explosions. These are more frequently gas explosions caused by overheated dryers or by shutting down a dryer before emptying it of its load of coal. Such explosions, while often serious enough in themselves, contain all the possibilities of much greater coal dust explosions, and could readily be avoided by more judicious firing or by correct dryer operation.

"Great carelessness continues to prevail in starting up and operating rotary kilns, especially in the matter of relighting a kiln following a short shutdown for minor repairs. Injury after injury from burns and occasional fatalities result from back-firing of kilns, caused by careless or incorrect introduction of coal into the kiln. Coal should never be blown into a kiln, following its temporary shutdown, before turning the kiln sufficiently to expose red hot clinker or lining, if, during the brief shutdown the interior surface of the kiln or its load has cooled off sufficiently to delay ignition of the coal, and then the coal should be introduced cautiously, and momentarily only if ignition does not take place almost immediately. Here again gas explosions of violent intensity or a gas and pulverized coal explosion is sure to follow the careless and injudicious introduction into the kiln of large quantities of coal. Occasionally serious pulverized coal explosions with damaging consequences occur as a result of irregular coal feeding or as flooding conditions occur, caused by bad coal or defective conveying and feeding equipment; but the most frequent rotary kiln explosions are caused by the improper firing of the kiln on starting up."

Luncheon Session

At the luncheon session, A. E. Snodgrass, chief clerk of the Louisville Cement Co., acted as chairman. The luncheon speaker was Harry Hutchens, manager of safety and insurance, Kentucky Utilities Co., who spoke on "Selling Safety." Mr. Hutchens pointed out the difference between his own safety problem and that of the men to whom he was speaking, in that the workmen in a cement plant are working in crews and are kept within the walls of a plant under the direct supervision of foremen. In his own problem his company has 1800 employes scattered over a territory of about 500 miles in one direction and over 300 miles in another. In some places the men are working singly and others in groups of two or three. The foreman is thus denied the advantage of personal contact with the management and, in some cases, does not have personal contact with the individual worker. It is true also that the workmen of a public utilities company have the protection of the public to think of as well as their own safety from accidents.

Afternoon Session

At the afternoon session, G. L. Kirp, chemist of the Kosmos Portland Cement Co., read a paper by A. C. Brown, works manager, on "The Investigation of Fatal

and Other Serious Accidents." Albert Shuey, chairman of the safety committee of the Lone Star Cement Co., Greencastle, Ind., read a paper on "Safeguarding Employes During Maintenance or Reconstruction Work," and Claude L. Baylor, assistant safety director of the Louisville Cement Co., read a paper on "The Employe."

Mr. Brown's paper suggested that the investigation of an accident may be conducted by any of the following: (1) department head or foreman; (2) safety engineer or director; (3) workmen's safety committee; (4) foremen's safety committee; (5) general safety committee; (6) special investigating committee.

He pointed out, however, that it is always the foreman's responsibility to report promptly every accident and near accident in his department. This should be done very completely and he has suggested a report blank covering every feature of an accident.

"In case further investigation is made later by higher authority than the foreman," continued Mr. Brown, "the responsibility of the foreman should be clearly brought out. In many industrial organizations, the foreman is held responsible for everything occurring in his department. He is the man in intimate contact with the work and workers; he was probably an eyewitness to the accident and knows more about it than anyone else.

"In plants where there is a safety director, the latter usually assumes charge of the investigation of accidents. It is his duty to question those who witnessed the accident fairly and considerately; to examine the scene of the accident, and all the equipment involved, and to discover all contributory causes, including personal factors which may have led the workman to be inattentive or reckless. He should be entirely impersonal and seek only the truth with no purpose but the prevention of other accidents in the future. When he has completed his observations, it is his duty to prepare a report that is clear, fair and convincing; this is one of the greatest contributions a safety director can make, and one of his greatest opportunities to impress upon the entire organization the value of safety work.

"In many companies, the workmen's safety committee investigates accidents and near accidents. Investigation by such a committee is particularly important in cases where the injured man is believed to have been at fault. If this committee, composed of his fellow workmen, investigating the accident immediately after its occurrence, finds that the injured man was in fact chiefly responsible for the accident and so reports, and if such report is then broadcast through the plant, it will probably create a much deeper impression upon the workers than a similar report made by the foreman or safety director.

Lone Star accident record

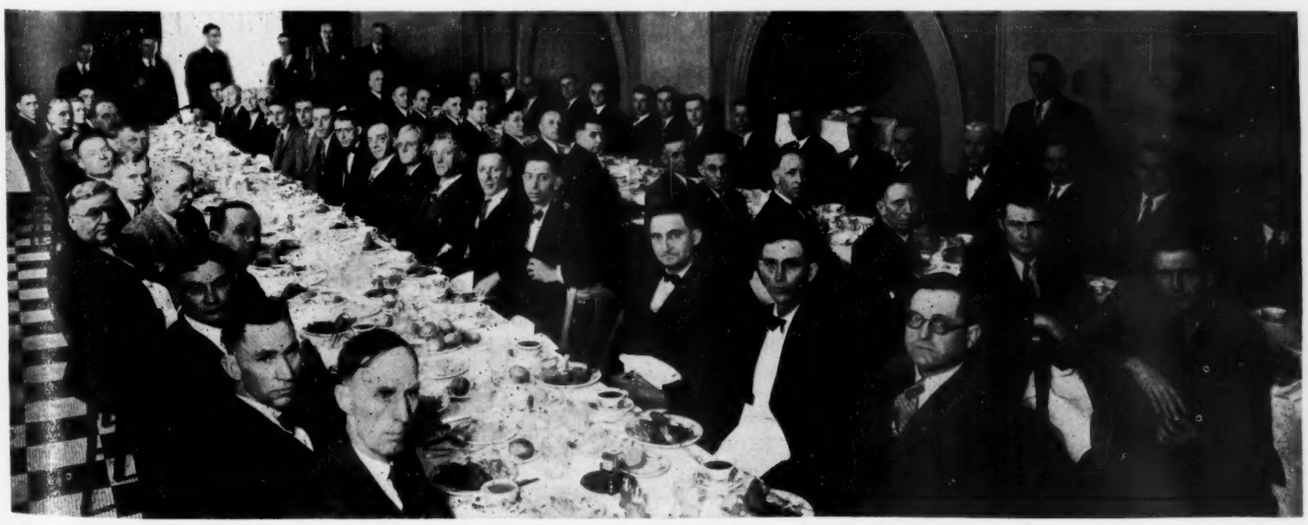
"In most plants, especially those of small or moderate size, safety activities are headed by a general safety committee, and this committee frequently assumes as part of its regular work, the investigation of accidents and near accidents. It should be part of the regular routine of this committee at its periodical meetings, to receive reports of all accidents occurring since the previous meeting and make further inquiry in cases of importance. It might be advisable to bring before this committee with his foreman an injured workman who has returned to work, catechising both workman and foreman on the circumstances of the accident."

Mr. Brown emphasized the necessity of conducting an investigation as soon after the accident as possible and also that it should be conducted fairly and impartially so that there might be no suspicion that its purpose or result is to "whitewash" anyone or "pass the buck." A verdict which places the blame on the workmen, particularly the man who was injured, is likely to be scoffed at unless the committee arriving at the decision includes a generous proportion of fellow workmen or supervisors having a good standing among their comrades.

The matter of looking after safety during construction work, in addition to the general safety program of the plant, came up for discussion, as it did at the Dallas meeting in January, and was covered quite fully by Mr. Shuey in his paper. While he felt that a construction program should receive the same or even greater consideration from the standpoint of accident prevention than ordinary plant operation, the tendency is usually in the other direction, and new men are brought in on the job who are not familiar with safety work or the working conditions of the job. He said:

"During the reconstruction of our plant, before we had hardly realized it, our hazards had become so numerous and serious, and conditions generally contrary to good housekeeping policy, that definite steps had to be taken to curb accidents, particularly among so many new men.

"In looking over the accident record for the month of July, 1928, a few months after reconstruction had started, we found there had been entirely too many lost-time acci-



Luncheon of the Louisville regional safety meeting

dents, and numerous doctor and first-aid cases reported. Consequently, a more vigorous and intense safety campaign was at once organized. The first step taken was to correct the hazard of uncleanliness and to maintain good housekeeping, as this has always been the policy of the International system."

Mr. Shuey then went into details regarding the inspection of scaffolds, cables, tools, etc., and also the guarding of alleys and walkways, the reduction of hazards in electric wiring, the need for temporary guards, the use of electric welding, cutting torches, etc. Regarding the educational side of the work he said:

"When we started construction work we found that we had hired many men who just thought we had to have accidents and that this safety stuff was all 'bunk,' or that they had never heard of safety as applied in industry. The first thing we did in this case was to get every man who knew and did believe in safety work to help convince the ones who did not. We had to show them why it was better for them to work safely by educating them to the principles of the proper application.

"There were many men working at the plant at that time who were away from their homes. Many of them were not keeping their minds on their work, possibly because of worry brought on by financial or other trouble unknown to others. There were also men living at home who were found to have worries that caused them to keep their minds off their work. Worry was found to be one of the most dangerous things we had to contend with. An unlimited amount of patience is required in handling this type of man, and in overcoming this hazard he must receive the hearty co-operation and interest of both the company and the employes.

"Every foreman should also realize that kindness and patience with his men will do more toward teaching them safe methods than trying to drive them. When the foreman gets it over to the men that he is trying to help them, and that he wants them to help themselves; when he has their confidence, and the understanding of all, as to the proper application of the safety rules which have been thoroughy drilled into them, the greatest difficulty is over."

In his paper on "The Employe" Mr. Baylor started out by saying that we should give at least as much care to the selection of the new man as we do to the selection of some important machine which we are about to purchase. Personnel should have certain specifications just as machinery and materials are secured on specifications. He feels that it is a great step forward in accident prevention and efficiency to be able to give the maintenance cost per workman in an organization.

"Physical examinations in detail," he said, "will reveal and bring to light weaknesses of far more importance than the selection of an inferior piece of mechanical equipment. How often in years gone by have we heard the same expression by some executive or foreman, 'Just send your brother-in-law around tomorrow morning and I can take one look at him and tell you if he is O. K. or not.' It is just such employment examinations as this that have filled various industries with a lot of misfits. It is only

Claude L. Baylor

under the rigid inspection of a good physician that the new or old employes' physical conditions can be brought to light."

Following these papers, there was a symposium on "How We Organized Our Plant to Win the Trophy," participated in by the following: H. H. Purkhiser, assistant superintendent, Lehigh Portland Cement Co., Mitchell, Ind.; V. Diefenderfer, superintendent, Wellston Iron Furnace Co.'s cement plant, Superior, Ohio, and Hugh H. Walker, secretary of the safety committee, Lone Star Cement Co., Greencastle, Ind.

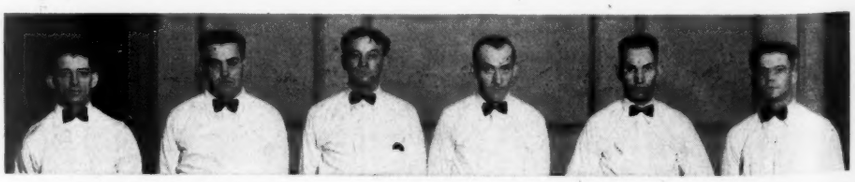
Mr. Purkhiser said that the preparation at his plant for the winning of a safety trophy began 16 years ago, when the first safety committee was organized. The method of organization today is practically the same as then except that experience has taught them some of the things to guard against and how it can be done. The safety committee consists of a group of foremen with the superintendent as chairman. This is a permanent committee to which is added a committee of employes chosen to serve for a period of one year. The semi-monthly meetings are planned for the entire year in advance, and each man is given a printed list to be used as a reminder, with special instructions that he is expected to attend, and especially not to consider other duties more important than his safety responsibility.

"In addition to the regular elected committee," said Mr. Purkhiser, "we invite about that many additional men, selecting them as nearly as possible from groups who are doing special work, such as construction or unusual repair jobs, or men who have had near accidents, whom we ask to report their experience to the committee, which usually brings out a discussion and ends with a definite decision on how and what to do. We put these decisions to a vote, then insist that the committee follow up and see that they are carried out. We believe by keeping our work democratic at all times we avoid any opposition from those whom it affects, and seldom do we have a complaint or request for appeal of the decision.

"If we do have a request for an appeal, the foreman instructs the man to come to our safety meetings and state his case.

"A careful study of the accident reports covering several years reveals that less than 5% of the total was caused by unguarded conditions, leaving 95% almost entirely caused by unsafe practices. Therefore, this has become the keynote of our safety efforts. The committee agreed that this fact justified a thorough campaign of education on the part of all members of the committee, together with the foremen and all those who direct men. If an accident does happen, the individual together with all connected with the case are invited to the next safety meeting of the full committee where a complete report is called for and the responsibility placed, if possible. Our committee is constantly on the lookout for conditions or practices which might produce an accident. Foremen are charged definitely to not only instruct their men what and how to do, but to follow each job sufficiently to know that orders are being carried out."

A similar plan was described by Mr. Diefenderfer as being in operation at his plant, installed in 1927. All the foremen are members of the safety committee, which meets twice a month at the plant office.



Team No. 2 of the Kosmos Portland Cement Co. Left to right, Fred Jupin, Pete McHolland, Heron Jones, Tom Mussleman, Paul Beavins, Henry Wigginton

V. Diefenderfer

Each department of the plant is given specific discussions at these meetings so that each foreman is not only "on his toes" in his own department but is familiar with the work in other departments. Continuing, he said:

"Besides this general safety committee we had two other committees of three men each, one for the mill and one for the mine, whose duty was to make a semi-monthly inspection and search carefully for possible hazards to workmen. They were required to make, in writing, recommendations for the installation of safety guards and the discontinuance of practices found in use that could result in injury, such as replacing belts or oiling various places while the machinery is running.

"These committees of three men were first selected at random from the various departments; there might be a day laborer, a miller, a packer, a machinist or electrician, but never a foreman. At each semi-monthly meeting the eldest in service was retired and another selected to replace him. In this way no man served more than six weeks at one time.

"Later we changed our semi-monthly foremen's meeting at the mill to one each month, and one each month at the local church house. At these meetings not only would the foremen be required to attend but all the employes would be urged to attend as well. Our object in this was to get in touch with every individual employed at our plant. These meetings were of a more general trend and besides the ordinary routine of business, speakers of ability were invited to make talks. Some of these speakers were men who have had experience at other plants where a safety campaign was in progress. Frequently a physician would make a talk, explaining an injury from a physician's viewpoint and telling why a slight injury must be cared for the same as a more serious one to prevent infection and loss of time, prehaps loss of a member of the body or even life.

"For the year 1930, we decided to make a supreme effort to have a clean record, and early in the year, in fact, at the first meeting, we decided to leave nothing undone that might be an aid to a safe record. The men were now so educated to safety that an accident was looked upon as somewhat of a disgrace to the one injured or to any one who might in any way be responsible. The superintendent made it clear that anyone who by negligence, horse-play or carelessness would cause an accident, would at once be replaced by a more careful man.

"As soon as the plant began operating in full, the company employed an efficient physician, who examined every employe to determine whether he had any ailment that would prevent his working to the safety of himself and his fellow workmen. The few men who were found to be suffering from any ailment curable by medicine were treated at the plant without cost to them. In checking the medical report, we were surprised to find an exceptionally high percentage of men with no ailments or defects."

Construction Work Requires Specialized Program

Mr. Walker also had the matter of reconstruction to deal with and found that the general safety program of the plant was insufficient to deal with an unusual situation of this kind. In the regular safety committee of this plant, the organization is somewhat unusual in that the member who represents each department is likely to be selected according to the first-aid and accident record of the month—that is, the man who is constantly reporting for first-aid treatment or who goes to the doctor during the month is selected as the representative for his department for the ensuing month. The same is true also if a man is careless about his work, so far as safety is concerned. This is considered an excellent method of instilling the safety spirit in these

First-aid team of the Lehigh Portland Cement Co., Mitchell, Ind.

W. H. Weitknecht

employes, as men readily assume a different attitude when brought in contact with the work in this way.

In addition to the general monthly meeting, departmental meetings of a few minutes' duration are occasionally held for stimulating greater interest. A class is continually taking instruction in first-aid work, and it is the ultimate intention to have every employe qualified to render intelligent first aid. The company sponsors the publication of an employes' paper devoted to the interests of safety work, which has created an unusual amount of interest among employes and serves as a source of current information. This company also has in operation a safety bonus, increasing year by year from $10 up to $50.

First Aid Contest Won by Kosmos No. 1 Team

The afternoon session closed with a first aid contest between two teams of the Kosmos Portland Cement Co. and a team of the Lehigh Portland Cement Co., Mitchell plant. It was managed by M. Powell of the U. S. Bureau of Mines. First honors went to team No. 1 of the Kosmos Portland Cement Co. under Captain Herbert Downs.

At 7:00 p. m. a dinner was held, with W. T. Groner, superintendent of Southwestern, presiding. At the speakers' table with him were A. N. Palmer, Lehigh, song leader; A. C. Brown, Kosmos; M. Powell, Bureau of Mines; Owens, Groner, Southwestern; Weitknecht, Lehigh; Diedenderfer, Wellston; and Claude Baylor, Louisville; also press representatives from the *Louisville Herald-Post* and the *Courier-Times*. Various representatives of the companies at the dinner were called upon for remarks and from 7:30 until 9:00 o'clock safety songs were sung under the leadership of A. N. Palmer and an entertainment was provided.

Fatal Blasting Accident at Salem, Mass., Municipal Quarry Laid to Carelessness

THE BLASTING ACCIDENT at the municipal crushed stone quarry, Salem, Mass., noted in ROCK PRODUCTS, October 25, p. 77, which resulted in the death of a workman and considerable property damage, was caused by carelessness, according to the finding of Special Justice Robert W. Hill. The *Salem Evening News* gives the following report of his finding:

"Decedent was employed by the city of Salem at its stone quarry and crusher and was at work on the day of the explosion. Peter Perron of 316 Lafayette Street, Salem, was the foreman in charge of the job and personally handled the dynamite. This quarry has been used for 23 years. It was originally close to the street, but year by year, the face of the cliff has been blown off, so that the spot where the blast in question occurred is now between 250 and 300 ft. from Jefferson Avenue. Since this work has been in process, the A. C. Titus furniture warehouse and salesroom have been established directly across the street from the stone crusher and not more than 350 ft. (at the outside) from the location of this blast.

"Fourteen holes were drilled 16 ft. deep. One hundred pounds of dynamite were used, being tamped down into the various holes; detonators and wires were placed in position; sand was tamped down about the dynamite, filling the holes to the top; iron screens and wooden ties were placed upon the holes; the workmen were all ordered to seek places of safety; guards were sent out to warn traffic on Jefferson Avenue; Perron, in charge of the battery and the wires, withdrew to a spot on top of the cliff safely distant; and, on receiving a signal from the guards below, Perron threw the switch and exploded the charge.

"Neither Perron nor his superior, Patrick J. Kelley, superintendent of streets, had any permit to blast. Perron had worked there 16 years and never had one. Kelley formerly had one in 1923 or 1924 but let it lapse. Just prior to the explosion he had been reminded of it by the chief of the fire department and had asked for one. It was not issued or dated, however, until November 11, 1930, and then only in Kelley's name.

"Whether or not a permit was necessary for this job is not clear. The specific reference to permits in the statute and regulations thereunder does not include the 'use' of explosives, but rather refers to the manufacture, storage, sale and transportation. There are intimations in the regulations, however, that make it seem very unwise that any individual using dynamite should fail to personally obtain a permit.

"The regulations are clear, however, that this blast was nearer Jefferson Avenue and the Titus buildings than was legal.

"The blast was not covered as required by law. The regulations prescribe as follows:

> Section 159. Before firing any blasts, except where the same are in a tunnel and distant from the place of portal more than 50 ft., or in a place so far away from any building or public street or public place that there will be no danger from flying fragments, the rock to be blasted shall be covered on the top and sides with timber, held securely together with strong chains or ropes and covered with pieces of sheet iron or stout woven matting of rope, or some other equally serviceable material that will prevent the debris from flying.

"Perron admitted that no such elaborate covering was used in this case, but told what he used as I have described it above. He has always used similar covering and apparently the legal requirements have not been brought to his attention.

"When the explosion occurred, a cloud of rock and dirt arose into the air and headed for Jefferson Avenue. It went over and into the boiler house, across the street, and through plate glass windows of the warehouse. Rocks went through the windshield of a truck standing in the entrance to the warehouse yard, injuring the driver. An automobile there was damaged. The boiler room wall and roof were pierced by rocks and a concrete wall on the farther side of the boiler room was thrown out on to the ground. Kelley, inside the boiler room, was struck by a large rock. Several others there were also injured, two seriously.

Accident Laid to Unexploded Charges in Old Holes

"Investigation disclosed the fact that nine holes, beside the 14 which were set off, had also exploded. It appeared that these nine were the unexploded part of a prior blast set off a week before. Perron had removed the detonators from the nine holes and had attempted to blow out the dynamite from them by air pressure. He admitted having put in at least 50 lb. of dynamite and of having removed about half a pailful of dynamite and dirt, weighing not over 4 lb. He then left them uncovered and with no sand tamping in the holes, and set off the new 14, almost directly beside them. The blast caused them also to explode, and to throw their rock into the air and away across the street. As they had no tamping, the holes acted more like rifle barrels, allowing the force of the explosion to go upward.

"Perron, on the stand, gave three inconsistent explanations of why he failed to explode these 9 holes before trying the new 14. His testimony on several other points was conflicting and very clearly inaccurate. I was obliged to conclude that he had no very good or very intelligent reason for passing over the 9 and exploding first the new 14 holes, but that rather on snap judgment he did so, and subsequently tried to justify his action by a series of explanations that failed to explain and were hardly understandable.

"A substantial amount of dynamite was left in the 9 holes, with no adequate protection, and all exploded with the other 14, throwing the rock, damaging the property, killing Kelley and injuring many others. It was the result of carelessness or ignorance on the part of Perron in not having taken adequate precautions against the very thing that happened and that should reasonably have been expected to happen.

"On the other hand, although Perron failed in his duty to take proper precautions, he has been on this job for 16 years with no other similar accident. He has been in charge of the blasting during this time and his superiors have apparently approved of his conduct of the work. He knows dynamite by experience rather than by study and special training. He either did not know as much about dynamite as he should, to be in charge of such important work, or else he guessed wrong as to its action in this particular case.

"In any case of this sort, there is frequently a demand for criminal prosecution, on the theory that someone should be punished. Except where the legislature has changed the application of the criminal law by making certain occurrences practically *prima facie* criminal, the old common law is still in force, and a criminal intent must still be found. Perron had no such criminal intent. He was too near the street, but he was doing this under orders, and this fact did not cause Kelley's death. He had no permit, and never knew he had to have one, but the lack of one did not cause or contribute to the death. This particular blast was not legally covered, but it seems evident that the rocks that did the damage came from the old 9 holes which he did not expect or intend to go off and therefore did not cover at all.

"The police in this case have, in my judgment, wisely refrained from making any arrests. I believe none should be made, but that the city authorities should so handle the situation as to guarantee to employes and public that such an unfortunate affair can never again occur."

Everett, Wash., to Have New Gravel Plant

DEVELOPMENT work on a large sand and gravel plant on Gedney Island, near Everett, Wash., will be started in a short time adding a new industry proximate to the port of Everett.

Articles of incorporation of the Hat Island Sand and Gravel Co. with capital of $50,000, were filed recently. The incorporators are L. B. Steadman and Victor Elfendahl of Seattle. Mr. Steadman is vice-president of Skinner & Eddy Co.

Two Hook-Ups for Air Separation

By Wm. A. Gibson
Managing Director, Bradley Pulverizer Co., Allentown, Penn.

THE employment of air separation in connection with grinding operations for the production of finished materials in the dry state is quite common in its application, as the air separator is the only type of apparatus that permits of a closed-circuit operation when dealing with dry materials in a fine state of subdivision.

The advantages of closed-circuit grinding are generally recognized and call for no extended comment, and whether applied to wet or dry work, the result has been a most decided increase in mill capacity, in comparison with open-circuit grinding, at any fineness within the range of commercial operation and without increasing horsepower requirements.

In wet-grinding metallurgical plants closed-circuit grinding may be said to represent standard practice, a notable example being the operation of the Utah Copper Co., capable of grinding 60,000 tons of a low-grade porphyry copper ore per day to a fineness of 90% through 100-mesh with mills 10 ft. in length.

The fertilizer industry has widely adopted closed-circuit grinding in connection with air separation in dealing with phosphate rock, and the portland cement industry has more recently given this subject full consideration with the result that the air separator is now very generally employed in cement plants.

It is the purpose of this discussion to deal with air separation, particularly in the cement plant, and to confine the discussion mainly to the employment of separation in connection with two-unit reduction as represented by the Bradley Hercules mill as a preliminary pulverizer followed by tube mills as finishing units.

As there appears to be some uncertainty concerning the proper method of installing and operating separators in conjunction with Hercules mills and tube mills, it may be well to say that ordinarily one of two different variations in hook-up is employed, although in some plants the arrangement is such that either may be used.

In what we will call "Hook-up A" the Hercules product is fed first to the separator (or separators) and the separator tails (oversize) go to the tube mills which are operated in closed-circuit with the same separators.

These two standard hook-ups are shown on the accompanying flow sheet, and it may be mentioned also that a third variation involving close circuiting of the Hercules mill is also employed and will be discussed later.

In dealing with these hook-ups it is customary to refer to the total load on the separators as being made up of two loads combined, namely, the tonnage of original feed and the tonnage represented in the separator tails which in all cases is in circulation; therefore, the total load on a separator consists of the original feed plus the circulating load, and the tonnage of finished product discharged from the separator must of necessity equal the tonnage of original feed introduced into the separator.

Suggestions for Choice of Method to Be Adopted

In making a choice of hook-ups, there is little to be said in favor of one over the other. If the resulting fineness in the Hercules product exceeds that in the separator tails, an opportunity is offered to scalp the Hercules product in the separator before sending it to the tube mills, as in Hook-up A. If the Hercules fineness, however, equals or falls below that of the tails, no opportunity is presented to scalp the product. It must be remembered, however, that in Hook-up A the tube mill tonnage is a minimum, as these mills handle the circulating load only, while in Hook-up B the tube mill tonnage is a maximum, as the mills handle the total load consisting of the tonnage of original feed plus the tonnage represented by the circulating load. In either case the actual work done by the tube mills is the same. In the first instance a lower tonnage is ground to a higher fineness and in the second case a higher tonnage is ground to a lower fineness. In mesh tons (tons multiplied by fineness increase) the tube mills do exactly the same amount of work regardless of hook-ups and regardless of the question whether separators are or are not employed.

Taking for illustration an actual case, the following figures resulted in operating Hook-up A on clinker:

Original feed	300 bbl. per hour
Hercules product	43% 200-mesh
Tube product	73.6% 200
Separator feed	60% 200
Separator finish	90% 200
Separator tails	36% 200
Separator efficiency	66⅔%
Total separator load	675 bbl. per hour

Computing on the basis of 5 bbl. per ton, it is evident that the tube mills are grinding 75 tons per hour from 36% thru 200 to 73.6% thru 200-mesh or in mesh tons $75 (73.6 - 36) = 2820$ mesh tons.

Now if we change to Hook-up B, the tube mills must grind 135 tons per hour and the tube mill feed will be a composite carrying 60 tons per hour of original feed running 43% thru 200-mesh plus 75 tons per hour running 36% thru 200-mesh, giving a tube feed of 135 tons running 39.11% thru 200-mesh. Therefore the work done in the tube mills is: $135 \quad (60 - 39.11) = 2820$ mesh tons, which checks with 2820 mesh tons for Hook-up A. As a further check against these figures, we know that the tube mills must grind 300 bbl. of original feed from 43% thru 200-mesh to 90% thru 200 (assuming no separators in use); therefore in mesh tons this work is represented by $\frac{300}{5} (90 - 43) = 2820$ mesh tons.

The decision therefore as to the proper hook-up to employ, particularly in existing plants, is usually governed by local conditions to be met, such as arrangement of plant, space available, etc., rather than by any decided advantage offered in the hook-up itself.

Formulas have been developed dealing with separator calculations, although in practice they are usually unnecessary. For example, in the foregoing illustration we may calculate separator efficiency by simple arithmetic. If we know that the total load on the separator is 135 tons per hour carrying 60% thru 200-mesh, it is obvious that 81 tons of 200-mesh material are passing into the separators hourly. If we extract from the separators 60 tons per hour carrying 90% thru 200-mesh, or 54 tons of 200-mesh material, the efficiency of our separators is $54 \div 81 = 66\frac{2}{3}\%$.

In dealing with separator installations, it may be accepted as good practice to divide the work between preliminary mills, finishing mills and separators into three equal stages; for example, if we desire to finish to 90% thru 200-mesh we can say that the Hercules mills will grind to 30% thru 200, the tube mills from 30% to 60% thru 200 and permit the separators to finish a feed of 60% thru 200 to 90% thru 200-mesh. This at least offers an opportunity of approaching the subject in a logical manner. If, however, we find that the Hercules mills will grind the tonnage to 40% or 45% thru 200-mesh, there is certainly no objection to this, as the work on the tube mills is necessarily considerably lightened. The important consideration is the fact that separators will readily carry the fineness from 60% thru 200 to 90% thru 200-mesh, or to other finenesses in the same ratio.

Another important consideration is the question of separator loadings and in dealing with this subject it is advisable to consider raw materials and clinker separately, as we cannot load a separator on clinker to the extent possible with raw materials, as separation on clinker is more difficult of

accomplishment due to the fact that there is a mutual attraction between the coarse and the finer clinker particles and consequently greater separator capacity is necessary for the same tonnage.

In selecting separators to handle raw mix we may say with a certain amount of assurance that separator load-carrying capacity will vary in direct proportion to separator area, or as the square of the diameter. We know from experience that a reasonable load for an ordinary separator required to operate with a good average efficiency would be $T = \frac{D^2}{4}$ (where T = total tons per hour and D = diam. in feet), whereas for high efficiency a loading of $\frac{D^2}{6}$ would be recommended and a loading of $\frac{D^2}{3}$ would probably represent the safe maximum loading where efficiency is a secondary consideration.

While the question of separator efficiency is not all-important, it is well to remember that as efficiency drops, circulating loads increase, and as loads increase, efficiency drops, so that it is possible with inadequate separator capacity to build up loads beyond the capacities of the elevators and conveyors provided.

An example of a separator calculation will be given and we will assume that it is required to handle with separators the product from a Hercules mill producing 40 tons per hour at a fineness of 45% thru 200-mesh, and to finish with tube mills and separators to 90% thru 200-mesh, the problem being to determine the proper number and size of separators to employ. It is further assumed that "Hook-up B" will be employed and that separator feed will carry 60% thru 200-mesh.

From experience we will select two 14-ft. separators which we have reason to believe will show an efficiency around 60% and on this basis we will compute the total load on the separators. We find this to be 100 tons per hour (by formula) and consequently we have a loading of $2\frac{14^2}{100}$, or the total load is approximately $\frac{D^2}{4}$, which is satisfactory for the efficiency assumed.

Confirming the statement that no formulas are required for such calculations, the total load will be determined by simple arithmetic, as follows:

We propose to remove from the separators 40 tons per hour carrying 90% thru 200-mesh, or 36 tons of 200-mesh material. In order to obtain 36 tons per hour of 200-mesh material with a separator efficiency of 60% we must introduce into the separator $\frac{36}{.60}$ or 60 tons per hour of 200-mesh material. We have stated, however, that the separator feed will run 60% thru 200-mesh; therefore the total tons of separator feed will be $\frac{60}{.60} =$ 100 tons as calculated above.

We know that the tonnage of separator tails will be 100 minus 40, or 60 tons per hour, and in a like manner we will calculate the percentage of 200-mesh material in separator tails.

We have introduced into the separators 100 tons per hour carrying 60% thru 200 or 60 tons of 200-mesh material. We have removed from the separator 40 tons per hour carrying 90% thru 200 or 36 tons of 200-mesh material, leaving 24 tons of 200-mesh material in 60 tons of tails, consequently the tails carry 40% thru 200-mesh.

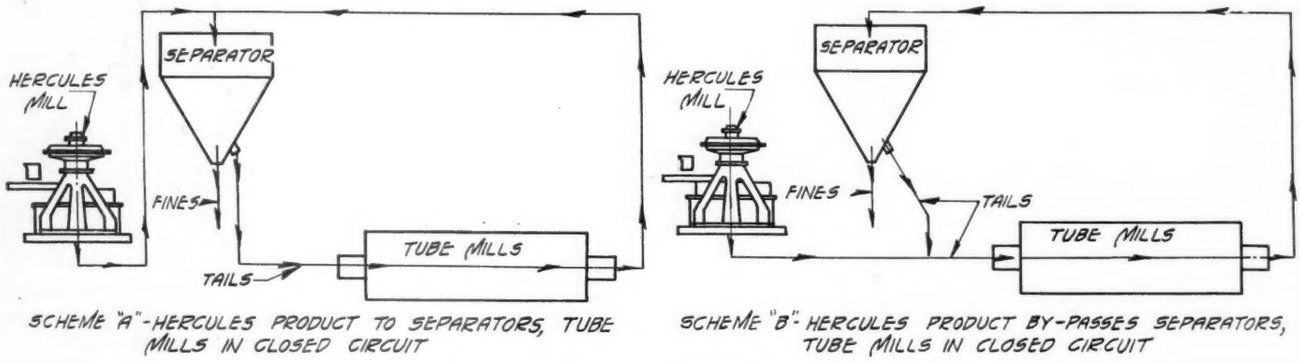
Composition of Tube Mill Feed Totaling 100 Tons

Our tube mill feed, therefore, is a composite consisting of 60 tons of tails running 40% thru 200 and 40 tons of original feed running 45% thru 200, making a total of 100 tons carrying 42% thru 200.

The tube mills, therefore, are required to grind 100 tons per hour from 42% thru 200 to 60% thru 200, or in mesh tons, 100 $(60 - 42) = 1800$ mesh tons. As a check against this last figure we will go back to our original proposition. Here we have 40 tons per hour to be ground from 45% thru 200 to 90% thru 200-mesh or in mesh tons 40 $(90 - 45) = 1800$ mesh tons.

In applying air separation on clinker it would seem that the air separators are limited in capacity to about the same extent as are the grinding units. In other words, if we wish to select the proper separators to handle the output of a Hercules mill on clinker, it would be advisable to employ the same separators indicated for use with this mill on raw mix and employ one 16-ft. separator or two 14-ft. machines.

The fact that we cannot clean separator tails as thoroughly on clinker as is possible on raw mix, where ample separator capacity will reduce the tails to a figure as low as 8 to 10% through 200-mesh, is perhaps of no particular disadvantage, for the reason that a clean separation on clinker would doubtless reduce high early strength, where an appreciable amount of 200-mesh material in the separator tails permits an additional amount of flour to be made in the tube mills by regrinding the fine product.



Flow sheets of the two hook-ups here described

Dealing with the close circuiting of the Hercules mill, this may be done in two ways, namely, by the use of external vibrating screens, or by means of air separators.

The use of vibrating screens in closed circuit with the preliminary grinding units in cement plants is not unusual. By this means it is possible to obtain a predetermined, uniform sizing of tube mill feed within close limits, and with such a feed, in comparison with ordinary open-circuit operation, the tube mill product is more uniform as to size and a high ultimate fineness may be more readily obtained. Under favorable conditions screens employed in this manner frequently attain an efficiency as high as 90%.

To obtain equal results by the substitution of air separators for the screens would necessitate separators of special design and it is a question whether or not such practice would justify itself, as the results obtained with screens are altogether satisfactory, and screens are by far the more economical, both as to first cost and power requirements.

It may be of interest, however, in this connection to digress for a moment and to say that a Bradley 16-ft. separator operating in closed circuit with a Hercules mill is capable of handling a total load of 85 tons per hour, finishing to suit the require-

ments of the operator—whether an agricultural limestone product or a finer product for mine dusting.

In this case the separator is of special high-efficiency design, carrying this heavy tonnage with an efficiency in the neighborhood of 85%.

Recent cement mill practice, particularly the research work carried out at the plant of the Nazareth Cement Co., fully demonstrates the thorough soundness of operating the Hercules mill as well as the tube mills in closed circuit. In the instance cited it was found that efficiencies of both the preliminary mills and the finishing units were considerably higher than were obtained in open-circuit operation.

It is unnecessary to comment at length upon the very great improvement in tube mill performance when mills are in closed circuit as compared to ordinary open-circuit operation, whether or not the preliminaries are in closed circuit.

Close circuiting the tube mill offers five very important advantages:

1. The opportunity to scalp tube-mill feeds when high in fines, thereby increasing tube mill efficiency.
2. A moderate working range is afforded, 60% thru 200-mesh ordinarily being fine enough for a separator feed, hence cushioning is avoided.
2. A more uniform product is assured and the constant fear of oversize in the finished product no longer exists.
4. Short mills may be employed.
5. Greatly reduced temperatures in tube mill products are observed.

Increase in Tube Mill Capacity

In dealing with the tube mill in closed circuit the question naturally arises as to what increase in tube mill capacity may be expected as against the same tube mill in open circuit operation. In the Nazareth tests referred to, the tonnage increase was approximately 100% and the mills finished roughly 1 ton of material per ton of ball charge. As this greatly increased output has not been generally observed elsewhere, it would perhaps be safe to say that on raw mix a tube mill in closed circuit should grind from 30 to 40 mesh tons per ton of ball charge.

If we can establish this factor within reasonable limits, and further experience will probably enable us to do this, then the problem of closed circuit operation will be greatly simplified.

The grindability factors of various materials will naturally enter into the question in so far as the selection of grinding units is concerned, but this does not necessarily affect separator performance and we can already say with assurance what may be expected from a separator under given conditions.

Further brief comment is offered upon another phase of closed circuit operation where separators are employed and a composite feed is given to tube mills, such feed consisting of two distinct materials, one harder to grind than the other. The opinion has been advanced that in these circumstances segregation is likely to result.

Experience does not confirm this view and we may cite the practice at a well-known cement plant, where a mixture of air-cooled blast furnace slag and limestone is ground in a Hercules mill followed by tubes in closed circuit with separators. This practice has been in effect for some time and no segregation is observed.

It is possible that segregation occurs during the initial starting of a unit and will continue until the circulating load builds up to a maximum, when equilibrium and uniformity are established.

In conclusion we would say that the advantages of closed-circuit grinding have been proven in almost every instance, and as one prominent cement manufacturer has said, "No matter what hook-up is used in air separation, the efficiency of the grinding plant itself is greatly increased, warranting its use." We maintain that there is no mystery in closed-circuit grinding and after months of investigation and practical experimenting we know that a given machine working on a predetermined material will give certain results, local conditions being the principal governing factor.

After a thorough investigation and practical experience we have developed formulas which permit us to tell the customer almost definitely what can be expected in the way of savings. Air separation definitely does three things:

1. Reduces horsepower consumption per barrel.
2. Permits of producing a finer material.
3. Positively produces a uniform material to any desired fineness.

Two-unit reduction is now more favored than ever, as it permits the cement manufacturer to produce a uniform, finely ground cement or raw material at a minimum horsepower per barrel and to meet the present day demands for a high-early-strength cement.

Will Reorganize

ON MARCH 4 a decree of the Federal Court was issued placing the Good Roads Machinery Co., Kenneth Square, Penn., in a receivership in equity. Earle S. Philips and Robert V. Bolger were appointed by the court as co-receivers to continue to operate the business. The receivership was a friendly one and was entered into with the idea of effecting a reorganization at the earliest possible date.

Mr. Philips has been vice-president and general manager of the Good Roads Machinery Co. for several years, and it is felt that the present action will be advantageous to all parties concerned. The company is solvent and it is hoped will be able to take care of all obligations at a very early date.

Long Island Battle of the Gravel Producers Waxes Hotter

NORTH SHORE BROOKHAVEN'S (Long Island, N. Y.) war against the gravel diggers reached a new climax recently when a police officer from the newly incorporated Village of Belle Terre drew his gun and held at bay an officer of the O'Brien Brothers Sand and Gravel Co. and a group of his workmen who, it is alleged, were about to attack him.

The trouble was an outgrowth of the determined fight being made by residents of Belle Terre to protect the beauty of the landscape on their promontory against unsightly gravel excavations. Recently the newly incorporated village drafted an ordinance forbidding the opening of gravel pits without a permit from the village. This ordinance was designed to halt the installation of the half million dollar gravel plant being installed by the O'Brien Brothers Sand and Gravel Co., which recently acquired the picturesque Fallon estate in Belle Terre.

Recently, as a means of gathering evidence against the O'Brien Brothers, Arthur Greene, a photographer, acting under orders from the village board, went to the O'Brien property to take pictures. He was accompanied by Policeman Julius Jensen, of Belle Terre.

According to Greene and Policeman Jensen, the two did not go on the O'Brien Brothers' property. They did, however, go on the adjoining property of the Seaboard Sand and Gravel Co., but first obtained permission to do so.

When Greene was about to take pictures from the Seaboard property, he was spied by Roderick C. Waller, the O'Brien official who is in charge of the Belle Terre operations.

According to Policeman Jensen, Mr. Waller rushed up, very angry, and demanded that both men leave. There was a heated discussion, and Waller is said to have threatened to break up the camera.

"Just then Waller called to a gang of his men who had been watching," Policeman Jensen said. "He motioned them at us and they all started for us and the camera.

"I saw that we were going to get the worst of it so I reached for my gun. It's a .38. And at the same time I called out to the men not to come closer or I would let them have it. It brought them to a stop before they reached us."

The near-battle came to a close without any pictures being taken. Greene and Policeman Jensen withdrew.

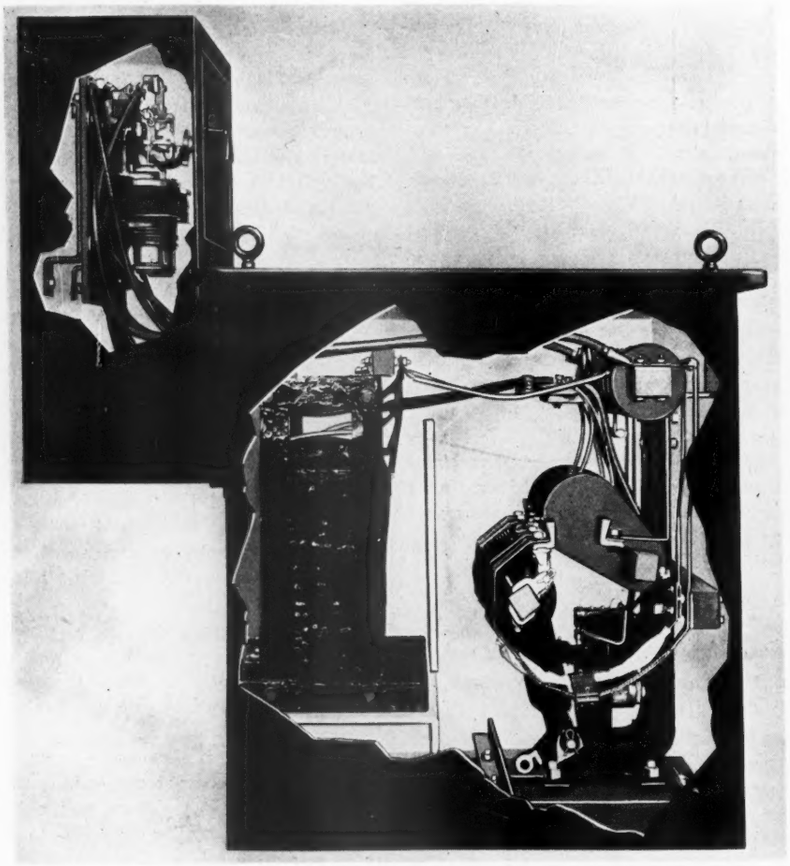
Since then, village officials are said to be preparing to issue a warrant for an arrest of some of the gravel men on the grounds that they have ignored and disobeyed the village ordinance. A test case is expected to be made, and careful preparations are under way to prepare the case.—*Riverhead (N. Y.) Review.*

New Machinery and Equipment

Magnetic Starter

THIS 2300-volt magnetic starter is being built by the Electric Controller and Manufacturing Co., Cleveland, Ohio, designated Type ZHS, full-voltage, magnetic starter.

This starter, complete with overload relays and a self-contained potential transformer, to secure 220 volts for the control circuit, is intended for across-the-line starting of squirrel-cage and synchronous motors, and it is said may also be used to control the primary of slip-ring motors. It is built for reversing, non-reversing and plugging applications.



Full-voltage magnetic starter for across-the-line starting of squirrel-cage and synchronous motors

In design the new starter, it is claimed, differs radically from the switchboard, circuit-breaker type commonly used in the past for full voltage starting of high voltage alternating current motors. The magnet armature, carrying the movable contact arm, is direct acting and is supported by only one large bearing pin. The entire unit is totally oil-immersed.

It is claimed that the contacts used on this starter are different from previous 2300-volt designs. They open and close the circuit with a wiping and rolling action, are duplicate and easily renewable.

As shown in the accompanying photograph, the enclosing case is a heavy, welded-steel tank housing the complete wired unit. A longer tank containing two type ZHS magnetic contactors, mounted back to back and mechanically interlocked, is supplied for reversing, non-reversing and plugging applications. This unit construction, the manufacturer maintains, provides a flameproof, corrosion-proof and dustproof installation that may be mounted anywhere with safety.

The type ZHS magnetic starters are available in two sizes—the No. 2 and No. 3, with maximum ratings of 600 hp. and 1200 hp., respectively. They may be controlled from a type M master switch, which can be arranged to provide low voltage release or low voltage protection, or they may be controlled from float switches, pressure regulators, altitude regulators and similar actuating devices.

Two New Valves Announced

TWO NEW VALVES, one a boiler-feed pump governor and the other a control valve, have been announced by the Bailey Meter Co., Cleveland, Ohio. Several distinctive features have been incorporated in the design of both valves.

The new boiler-feed pump governor illustrated in Fig. A is designed primarily for use with turbine driven pumps. Its purpose is to maintain a constant differential between the pressure of steam leaving the boiler and the pressure of feed water in the feed water lines. The governor is installed in the steam line to the turbine and controls the differential pressure by throttling the steam supply.

Feed water pressure is transmitted to the inside of the sylphon *G*, this force being balanced by the steam pressure and the spring *K* on the outside of the sylphon. When the steam pressure decreases, the sylphon expands, moving the valve mechanism upward, thus throttling the supply of steam to the turbine. In a similar manner more steam is admitted to the turbine when the steam pressure rises. To bypass the governor, valve *A* is closed and valve *B* is opened, thus equalizing the pressure on the inside and outside of the sylphon so that the spring will hold the valve in its open position.

According to the manufacturer, the governor may be set for any desired differential by adjusting the spring tension by means of

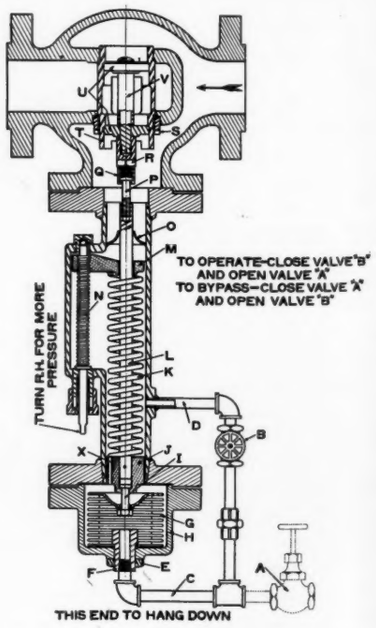

TO OPERATE-CLOSE VALVE "B" AND OPEN VALVE "A"
TO BYPASS—CLOSE VALVE "A" AND OPEN VALVE "B"
TURN R.H. FOR MORE PRESSURE
THIS END TO HANG DOWN

Fig. A. Boiler-feed pump governor

screw *N*. There are no glands or stuffing boxes on the valve rod, so that its motion is not retarded and there is no tendency for the valve to leak.

The valve is of the tight seating and fully balanced design, and the entire seating arrangement can be easily installed or removed from the valve body without taking the body from the line.

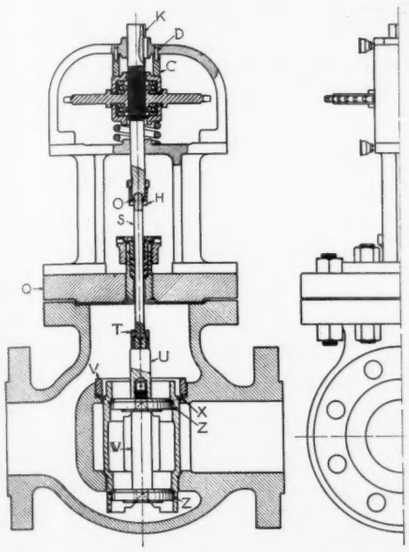


Fig. B. Cross-section of control valve

The new control valve, Style K, illustrated by Fig. B, is for use with Bailey automatic control systems and can be used with practically any fluid. The V-ports, it is claimed, are scientifically designed to give a straight line flow characteristic. A fully balanced valve with the valve cage and discs removable are other distinctive features.

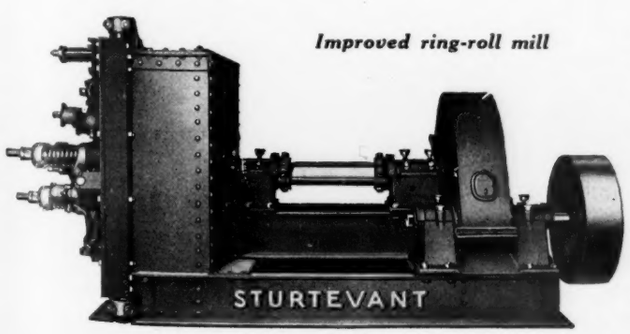
Improved Pulverizer

THE STURTEVANT MILL CO., Boston, Mass., announces an improved ring-roll mill, which it is claimed grinds either hard or soft substances, such as limestone, phosphate rock, shells, gypsum, fire brick, etc., with equal efficiency. This is a "closed-circuit" pulverizer furnished with screens for products of 8-mesh to 50-mesh and with air separators for products finer than 50-mesh.

The mill will take feed 1½-in. and finer, and has a range of output from 8- to 200-mesh. Material being ground forms a constant layer between grinding members, so that wear is practically eliminated, it is claimed. The mill has been designed to eliminate vibration, permitting the use of inexpensive foundations and further reducing wear and tear on the entire mechanism.

The machine has heavy duty Hyatt roller bearings in rolls and counter-shaft, and is arranged for connection to motor. According to the manufacturers, the construction is absolutely balanced, and the mill cannot be damaged by entrance of tramp iron. There is "open door" accessibility to all wearing parts, and part replacement, when necessary, can be done easily.

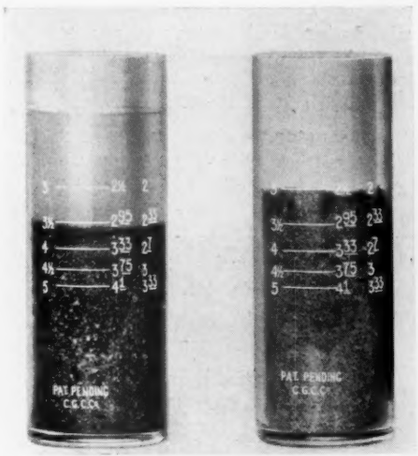
Operation, it is said, is almost noiseless.



Improved ring-roll mill

Bulking of Sand Determined by Simple Device

WHERE concreting operations are carried out on a large scale, allowance is made for the effect of moisture in producing bulking of sand and uniformity of proportions is obtained by some sort of inundating device. On many operations, however, an inundator is impracticable. Since, in cement-gun work sand is used in a relatively dry state, the inundation process cannot be used, and to take the place of this the Cement-Gun Construction Co., Chicago, Ill., has devised what it calls a "Bulkometer."



At right, the instrument filled up to top line with moist sand. At left, after it has been filled with water and sand allowed to settle

The device is simple in operation and a bulking test of sand can be made in a few moments without requiring special skill or training. The manufacturers state that it has been tested by the Portland Cement Association and found to be accurate to within practical limits.

The apparatus consists simply of a glass vessel with three columns of graduations to correspond to mixtures of 1:3 (commonly used for Guncrete), 1:2½:5 and 1:2:4. The instrument is filled to the top line with moist sand just as it comes from the pile, filled in loosely as it would go to a mixer. Water is then added and the sand thoroughly inundated and allowed to settle. The height of the sand indicates on the graduation the volume of sand which should be used to obtain a true mix of the proportions desired.

New Line of Lifting Machines

THE ECONOMY ENGINEERING Co., Chicago, Ill., has announced a new line of ball-bearing equipped lifting machines. Both hand and power operated, plain and telescoping machines are included in the new development, the machine shown being an Electric Telescoper.

Ball bearings, in these new models, are used throughout the gearing and in the sheave and platform frame wheels. On the Telescopers the sliding frame wheels are also equipped. Friction is further reduced through recently designed flangeless guide wheels which are used to support the platform and telescoping frames.

The manufacturers claim that an actual 25% increase in efficiency is the result of the introduction of these two features, that in the new hand-power type 25 lb. cranking pressure is required to lift the rated load and in the 1931 electric models the greater efficiency has been used to provide a proportionately faster travel of platform.

Telescoper type lifting machine

Tennessee Marble Companies Merged—Now Owned by Big Business Men

MERGER of the Ross and Republic Marble Co. and Ross-Republic Marble Corp., Knoxville, Tenn., was announced recently.

The Ross-Republic corporation has operated the marble company under lease the past year. With the merger of the two companies control of marble quarries valued at approximately $1,000,000 passes into the hands of a group of New York financiers. Frank S. Mead, of Knoxville, owner of the Ross and Republic company, received a minority stock in the Ross-Republic corporation.

The Ross-Republic corporation is a subsidiary of the Virginia Alberene Corp., quarriers and manufacturers of soapstone products.

J. J. Brown, chairman of the board of the Foster Wheeler Corp., of New York, is president of the merged companies; Grant Huntley, of New York, vice-president and general manager, and J. R. Cowan, of Knoxville, local manager.

In addition to the officers, directors are: Frank Mead; George H. Tidd, of New York, president, American Gas and Electric Co.; C. E. Groesbeck, executive vice-president, Electric Bond and Share Co.; Harry Brown, E. G. Parsley, John W. Doty, C. S. Newhale—all of New York.

The quarries will be operated under the same general plan as previously, Mr. Huntley said. He expressed great confidence in the future of the marble business. "We have on hand now more orders ahead than we had at this time last year," he said. "Business in general is growing gradually better. There is unmistakable evidence to that effect. We feel that 'business depression' will soon be a thing of the past."—*Knoxville* (Tenn.) *Journal.*

T. N. Haffner Made Superintendent of Keystone Cement

ANNOUNCEMENT was made March 4 of the appointment of T. N. Haffner, of 728 North Eleventh street, Allentown, Penn., as superintendent and mechanical engineer of the plant of the Keystone Portland Cement Co., at Bath, Penn.

For the past eighteen months Mr. Haffner had occupied the position of mechanical engineer with the Keystone Co. Prior to that time he was associated with H. H. Leh, present general manager at the Keystone plant, as mechanical engineer with the Nazareth plant of the International Cement Corp. and the plants of the former Phoenix Portland Cement Co. During his connection with the Phoenix company, Mr. Haffner was chief engineer of the design and construction of the southern plant of the company at Birmingham, Ala.—*Allentown* (Penn.) *Call.*

Buffalo Aggregate Producers Oppose New Restrictive Legislation

BUFFALO, N. Y., opponents of bills to empower communities to regulate the sand and gravel mining industry laid down a letter-barrage upon Erie county legislators as they returned for the resumption of law-making duties at Albany, N. Y., recently.

From the Buffalo Slag Co. and kindred concerns of the Buffalo area came vigorous protests against the Thompson measure, which would authorize Buffalo or any city, town or village, to set up rules governing the conduct of the sand and gravel industry and require posting of a bond to guarantee performance of conditions imposed.

Pointing out that sand and gravel firms of Buffalo and Genesee, Cattaraugus and contiguous counties are desirous of "conducting business with proper respect for community rights," the Buffalo Slag Co. by Secretary-Treasurer H. N. Snyder declared that the proposed law should not be enacted for four major reasons. The writer contended that local ordinances can be made sufficient from the standpoint of health; that one community might enforce the permitting provisions, saddling a great burden on some company, while a nearby competitor might not have such provisions imposed upon him; that existing laws afford sufficient safeguards for the public, and that the pending bill would confer powers which if exercised unreasonably "would ruin any company."—*Buffalo* (N. Y.) *Courier Express.*

To Specialize in Agricultural Limestone—Indiana

THE NEWTON COUNTY STONE CO., Kentland, Ind., one of the leading industries of this part of the state, has purchased and will install immediately new stone-crushing equipment especially adapted for the manufacture of limestone fertilizer. It is a well-established fact that the quality of limestone available at the local plant is excellent and the increased demand for lime dust as fertilizer made it necessary to increase the capacity of the plant in that particular field. The new crusher, which is of the hammer mill type, was purchased from a St. Louis manufacturer. The installation of the new machinery is in line with the progressive policy of the Newton County Stone Co. and opens up a larger field for products of the plant.

As an indication of the possibilities in the fertilizer field, officials of the stone company announce that one of the first orders received this year called for the delivery of 1000 tons of limestone to the Green Acres Farms in north Newton county.

Officers of the Newton County Stone Co. include George H. Hart, general manager; C. O. Riggs, superintendent, and R. D. Virgin, secretary.—*Kentland* (Ind.) *Enterprise.*

New Crushed-Stone Plant Projected in Ohio

CREATION OF A NEW UNIT in the stone industry northwest of Columbus, Ohio, which will give the city a new company, a modern stone plant and a working organization of not less than 75 men, was revealed March 7 in plans of a group of northern Ohio stone producers.

Working with the Ohio Road Improvement Co., 341 Chamber of Commerce building, Columbus, which intends to act as the sales part of the organization, this group of northern Ohio stone men has purchased a 75-acre tract of stone-bearing ground surrounding the north side of the little settlement of Mounds Station, at the junction of the Williams and Robinson roads.

Here on a site which is traversed both by the Pennsylvania and New York Central railroads, it is planned to erect a modern stone crushing plant which will produce railroad ballast, highway stone and associated stone specialties. The Ohio Road Improvement Co., which markets the products of the Asphalt Rock Corp., of Kenton, and the Central Oil and Emulsion Co., 1111 McKinley avenue, Columbus, will handle the entire output of the new company, which is expected to get into action during the summer.—*Columbus* (Ohio) *State Journal.*

Pennsylvania-Dixie Cement Appointments

THE Pennsylvania-Dixie Cement Corp., New York City, announces the appointment, effective immediately, of O. C. Hunt as sales manager in charge of the territory served by its Des Moines, Iowa, plant. His headquarters will be in the Insurance Exchange building, Des Moines. R. J. Hild continues as district sales manager.

Prior to his connection with the cement industry more than 16 years ago, Mr. Hunt had wide experience in the building supply business. For more than a year he has managed one of the eastern sales districts of the Penn.-Dixie organization.

L. C. Currinder has also joined Penn.-Dixie's western staff, with headquarters in the Des Moines office of the corporation.

Los Angeles County Authorities Make It Harder to Establish New Plants

HEREAFTER when an individual or a company applies for a permit to operate a rock-crushing plant in Los Angeles county, Calif., and it is denied, another petition for the same project cannot be filed within a year, the Board of Supervisors decided recently in amending the ordinance. The amendment was agreed upon following the denial of a permit for a rock crusher near Baldwin park requested by C. W. Coughran.—*Los Angeles* (Cal.) *Times.*

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Producers Discuss Sales Methods

By E. S. Hanson

Products plant of Penniman Concrete and Material Co., Dallas, Texas

SALESMANSHIP was stressed as the present vital need in the concrete products industry, at the recent joint convention in Milwaukee, Wis., of the National Concrete Masonry Association and the Wisconsin Concrete Products Association.

One of the principal papers on salesmanship was given by **Nolan Browne**, of Dallas, Tex. Mr. Browne is vice-president of the Penniman Concrete and Material Co., of Dallas, which has been in the mineral aggregate business for a great many years, and more recently in the manufacture of concrete products and the production of ready-mixed concrete.

One of the important facts in regard to salesmanship pointed out by Mr. Browne was that his company, in order to give distinctiveness to its product, has given it the trade name of Wall-Crete. It is therefore not selling simply wall units, but a product with an individuality, back of which is the pride and responsibility of his company. This name has been copyrighted and confidence in it has been established by getting as many architects and prospective purchasers as possible to visit the plant and note the care with which these masonry units are manufactured. The laboratory and weight-batching equipment are given particular emphasis on such occasions.

The company also works with architects and builders by supplying them with blue prints of typical construction, with details and explanations of the more important features, showing how they can be worked out in Wall-Crete.

Comparison with Other Materials on Six Points

Mr. Browne made a comparison of concrete tile and clay brick for wall construction on the basis of six points: strength, permeability, weight, adhesion of covering materials, insulation, and economy.

Regarding the adhesion of covering materials, Mr. Browne said: "We have frequently to overcome a belief that it is difficult to get such applications to bond to concrete. This is partially true in the case of wet-cast concrete which presents a close-grained, almost glazed surface composed largely of cement and extra-fines when beams, walls and columns are wet-cast against forms. The same conditions do not obtain with concrete masonry units because they are made with a much drier mix. Fines and water are not concentrated on the face. The surface which concrete masonry presents is ideal, being slightly rough and porous. The perfect bond is secured. Of more importance, in our opinion, than the initial bond is its permanence. When concrete masonry is used the backing and the stucco are composed of substantially the same materials and therefore have more nearly equal coefficients of expansion and contraction. When two materials are bonded together either by natural cementation or mechanical bond, and one expands more than the other, the difference must be equalized by cracking and crazing. This accounts for, in part at least, the common tendency of stucco over brick to check very severely. On walls resting on the foundation and

parapet walls of brick where moisture may penetrate from below or above, getting in behind the surface coating and expanding the brick backing, there is brought about a particularly serious source of trouble."

Cost Factors Analyzed

In spite of everything, however, Mr. Browne acknowledged that cost is quite frequently a controlling factor which clinches a sale. He went into considerable detail to analyze the cost factors in masonry construction, as follows:

"There has undoubtedly been a tendency lately on the part of builders to get the most floor area for the fewest dollars. In many instances this has led to serious abuses, proper design of foundations and waterproofing precautions being sadly neglected. But, fortunately, in so far as the walls are concerned, a great saving may be had by using concrete masonry without impairing the utility of the structure. The primary masonry unit cost is quickly analyzed by comparing six times the per-thousand price of brick with that of the tile. On the present market this shows a saving in favor of Wall-Crete of $4.00 per thousand 5¼x8x 12-in. units, which is equivalent to $0.67 per thousand brick.

"Mortar costs are analyzed as follows: 1 cu. yd. of mortar will lay 1500 brick. Six thousand brick require 4 cu. yd. at a cost of about $8.00 per cu. yd., making the cost of mortar for 6000 brick $32.00. One and one-half cu. yd. of mortar is required to lay the equivalent 1000 Wall-Crete units at a total cost of $12.00. This shows a saving of $20 per thousand 5¼x8x12-in. units, or $3.33 per thousand brick.

"Regarding the cost of labor, let us advise that the friendship of masons should be so carefully cultivated that they will prepare their bids in a sympathetic frame of mind. Early in our experience we found that when we ventured a prediction of the cost of the material in the wall we assumed two dangerous chances. If our guess was too high, our prospects of interesting the purchaser were diminished. If we guessed too low, it was almost inevitably embarrassing to us. A reliable mason, feeling that it was worth more, would so bid, whereupon the owner to whom our guess had been made would likely tell him that we said the job could be done for less. This could immediately create a very unfavorable impression in the minds of both the owner and the mason. Another difficulty in stating total costs was the unsettled cost of labor, particularly during the last year. Should we make an estimate, it would be predicated on union labor scale wages and we frequently find some mason agreeing to lay brick for ridiculously low wages.

"Therefore, we have consistently endeavored to adhere to a comparative cost ratio method of analysis in so far as labor is concerned. We begin by calling attention to the fact that one of our units replaces six brick and that it can be laid easily in the time required to lay three brick. Incidentally, in so doing the mason handles substantially the same total weight of material, which seems to be an important consideration. It is obvious, therefore, that regardless of the wages of labor per hour, the labor cost on a Wall-Crete wall will not be over one-half that of a brick wall. If we know what the particular contractor concerned pays his masons, we can extend the figures based on whatever quantity of brick he claims they will lay, always using one-third as many tile."

A Year of Education

The whole program of the convention was attuned to present conditions rather than being an abstract discussion of theoretical problems. Practically every man who attended came with the one thought in mind of sounding out his fellows on 1931 possibilities and by pooling their knowledge, arriving at a better understanding of how to meet present conditions.

D. R. Collins placed the situation squarely before the members in his presidential keynote speech at the opening of the convention. He characterized the past year as one of trial and tribulation and yet with it all a year of education. Concrete products plants have fallen by the wayside and yet on the other hand there have been plants which have grown and flourished. Some plants have been eliminated and the fittest have survived. Business has not been handed out to those who sat in the office waiting for it, but those who have gone out after business with an intelligent sales effort have had reasonable prosperity.

"The plants that have gone backward are the backward plants," he said, "managed by men of no vision, no initiative, no resourcefulness. The plants that have held their own and have progressed have done so by the application of lessons they have learned —the lesson of the application of modern merchandising methods, and the lesson of diversification. The concrete products manufacturer who has sat in his plant and bemoaned the hard times is still sitting there today—and will probably be sitting there a year from today; but the manufacturer who has used his head, who has developed new products and new uses for his products, is most certainly in better shape than he was a year ago today."

Mr. Collins said that he had not lost faith in the concrete products business but has more faith in it today than he had a year ago; for he has seen its development, has been able to visualize its greatness and its possibilities, and from his contacts has drawn inspiration that leads him to a wholesome enthusiasm for the future.

"We are definitely and surely on our way back," said the president. "But our prosperity in 1931 is largely up to us. The only fear that I have for the coming year is that too many of us are sadder than we were in 1928, but not wiser—that we have not applied the lessons that we have learned. When the crash came in 1929 and the business of a large share of our industry suddenly went to the 'bow-wows,' a few of you knew what to do. You simply used your heads, you buckled down to intensive selling. You made a better product. You dug up new outlets for the product you were then making. You developed new products.

"There is a lot of human nature back of what you have done the past two years and what you will do in 1931. Fortunately you now know more about the cure for your ills than you did in 1929 and you're going to apply that cure. You're going to knuckle down and work your way out. You have a wonderful business future ahead of you. More and more you are realizing that you have only scratched the surface—that the outlet of your product is far greater than your fondest dreams of two years ago."

Ten Rules for Success

The president then closed with his ten rules for the successful conduct of the concrete products business for the next five years. These are:

1. Make only a product of the highest quality and give your customers more real value for their money than your competitors.
2. Learn to produce your product in the most economical manner possible.
3. Learn to limit your production to fit closer to demand.
4. Build your organization so that in every department it is efficient. Get rid of low priced men who prove themselves expensive by the blunders they make.
5. Develop an aggressive sales force and use high class advertising.
6. Watch your distribution costs carefully and cut them where you can.
7. Make a fair profit on every order you take.
8. Base your selling price on your true production costs.
9. Study your business continuously so that you may not only eliminate waste practices but may develop new products and new uses.
10. Work together with your fellow manufacturers and support your trade associations, not only for your own individual benefit, but for the benefit of the industry as a whole.

Profits for Tomorrow

Austin Crabbs of the Cement Products Co., Davenport, Iowa, was assigned the topic, "Digging Tomorrow's Profits Out of Yesterday's Depression." It was a topic well suited to his temperament and business habits, for he is notably one of the thoughtful and forward looking men in the business.

While he is one of those who has turned with renewed hopes to the new year, he is not willing to make any definite predictions as to when we shall experience a general

improvement in business. He is willing to believe, however, that the present crisis is no different than those of the past, and perhaps it has even now run its course.

What We Have Learned

"It is now over a year and a half since business reached the peak of 1929," he said, "and so let us see what we of the concrete products industry may have learned in this school of experience. First we have found out that the post-war housing shortage was not a permanent proposition, but that housing facilities in a comparatively few years caught up with demand. Thus those of us who were supplying concrete block for foundations only got the first jolt—there were practically no more foundations being built and overhead began to eat us up. If we had gone a step farther and worked our way above grade, we didn't get hit quite so hard or quite so soon, but the effects of the depression were gaining on us none the less surely. Many may have seen the writing on the wall and anticipating the time when enough concrete block could not be sold to cover fixed charges may have added other products such as burial vaults, roofing tile, drain tile or any of the numerous other articles made of cement and aggregate and that go to make up a diversified concrete products plant. In many cases these items, perhaps started as side lines, have proven a valuable source of revenue, offsetting, at least to some extent, the loss of revenue from concrete block.

"Still other companies have gone outside of the concrete products field and taken up such lines as sand and gravel, cement and lime, and other mason materials, which do in fact fit right in with concrete products. Even brick and other clay products have been profitably handled. If it is true that you can perform a service to your community in the sale of mason materials and brick, then other lines not so closely related to concrete products perhaps could be added to round out the organization, show an added profit and increase our ability to serve."

Summarizing the situation, Mr. Crabbs said that our way out lies in diversification, consolidation, or a combination of the three, and the sooner we recognize the seriousness of the problem the better it will be.

The Value of Research

The subject of "Research as a Means for Developing Increased Sales" came early in the discussion, being introduced by **Einar Christensen,** consulting engineer for the National Building Units Corp., Philadelphia, Penn. Mr. Christensen said that he might, if he chose, condense his talk to a repetition of the good old statement that a real salesman must first of all know his product. This statement he takes as good and sufficient reason for the necessity of research.

Research, however, is usually conducted by an engineer, and he acknowledged such a man sometimes has no vision for anything but engineering. On the other hand, there is the salesman, who likes to assert proudly that his product is positively the best there is, but is not always prepared to state why. In the highly competitive field of masonry, said Mr. Christensen, there are several good products besides ours and one has to be vested with more authority than that of a good and likeable salesman to have these positive statements accepted. But, he pointed out that there usually is no direct contact between the salesman and the engineer; they think in entirely different terms

D. R. Collins

and have difficulty in meeting on a common ground. So here he introduces an interpreter who can translate the Greek symbols of the research engineer into simple and eloquent English—an interpreter who can make the facts easily understandable.

Another paper along similar lines was by **Herman Frauenfelder,** of the Algonite Stone Mfg. Co., St. Louis, Mo., entitled, "How a Research Program Can Develop Business." He devoted his talk primarily to the research work being done by the Cast Stone Institute, as his company is a manufacturer of a synthetic stone product.

Advertising Aids Sales

Another aid to salesmanship was presented by **R. Marshall** of Detroit, Mich., advertising counselor, who talked on direct-mail advertising for products manufacturers. Mr. Marshall has been closely allied with concrete work for many years and was able to make valuable sales suggestions from his intimate knowledge of the problems of the products manufacturer.

Sand and Gravel Producer Goes Into Products Business

THE NEUMAN SAND AND SUPPLY CO., York, Penn., will soon begin the manufacture of several concrete products at its plant, which is located in the vicinity of Louck's mill, along the Pennsylvania railroad tracks. The products will be made of sand and cement. The articles it will manufacture will be the Albright double-ribbed silo staves, and concrete blocks for the erection of brooder, poultry and milk houses. The products will be placed on the market within the next few weeks. It is a possibility that the company will incorporate within the near future. Edward Neuman, 530 Madison avenue, is president of the concern.—*York* (Penn.) *Dispatch.*

Another Ready-Mix Plant

THE PIONEER SAND AND GRAVEL CO., Seattle, Wash., will spend $50,000 in constructing a "Tru-mix" concrete handling plant at 901 Harrison street.

It is proposed to build a wharf, bunkers, conveyor gallery, install a large crane and provide the most modern concrete mixing facilities available. Plans for the new plant were drawn by H. J. Prosser (care Pioneer Sand and Gravel Co.).—*Seattle* (Wash.) *Journal of Commerce.*

New California Products Plant

COLTON'S (Calif.) newest industry, the Concrete Conduit Co., started its first commercial operations February 16 at a new and modern plant located south of Colton.

The company, which has installed new and elaborate machinery to make concrete irrigation pipe, is headed by John K. Paden as vice-president and general manager. He is experienced in this work, as well as conditions in the orange-growing belt, where much of the product will be used. George McIntyre, who is well known in Colton, will be actively in charge of production.

Colton was selected as the site for the enterprise because of the proximity both to cement and sand, and also because it is centrally located in the citrus belt.—*San Bernardino* (Calif.) *Sun.*

New Culvert Pipe Project

REPRESENTATIVES of the Wilson Concrete Co., of Red Oak, Iowa, have been in Washington, Iowa, to negotiate for a site on which to locate a plant for the manufacture of concrete culvert pipe.

The Wilson Co. recently secured a contract to build and install concrete culverts on county roads here, and they propose to set up a local plant for the manufacture of the culverts to be used in this county.

Members of the firm intimated that if everything worked out right, they might make their plant here permanent.—*Washington* (Ia.) *Journal.*

The Rock Products Market

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.15	1.15	1.75	.....	1.75	1.75
Erie, Penn.	.80	1.00	1.25	.....	1.25	.....
Leeds Jct., Scarboro, Me., and Milton, N. H. (b)	.....	.50	.....	1.75d	1.25	1.00c
Machias Junction, N. Y.	.75	.75	.75	.....	.75	.75
Montoursville, Penn.	1.00	.70	.60	.40	.40	.40
Georgetown, D. C.	.55	.55	1.00	1.00	1.00	1.00
Washington, D. C.	.85	.85	1.30	1.30	1.30	1.30
CENTRAL:						
Attica, Ind.			All sizes .75–.85 per ton			
Barton, Wis. (e)	.....	.35	.55	.60	.60	.60
Cincinnati, Ohio	.55	.55	.80	.80	.80	.80
Columbus, Ohio	.65– .95	.30– .75	.50– .75	.50– .75	.50– .75	.....
Crystal Lake, Ill.	.40	.20	.25	.35	.35	.40
Des Moines, Iowa	.40– .70	.40– .70	1.50–1.85	1.50–1.85	1.50–1.85	1.50–1.85
Eau Claire, Wis.	.50	.50	.65	1.00	1.00	.....
Eklhart Lake and Glenbeulah, Wis.	.40	.50	.50	.50	.45	.45
Grand Rapids, Mich.	.....	.50	.70	.70	.70	.70
Greenville, Ohio	.50– .70	.40– .60	.50– .60	.50– .60	.50– .60	.50– .60
Hamilton, Ohio	.65– .75	.65– .75	.65– .75	.65– .75	.65– .75	.65– .75
Hersey, Mich.	.....	.50	.....	.70	.70	.70
Kalamazoo, Mich.	.....	.45	.50	.60	.75	.....
Kansas City, Mo.	.....	.70– .75	.....	1.50	.....	.....
Mankato, Minn.	.....	.45	.....	1.25	1.25	1.25
Mason City, Iowa	.....	.50	.85	1.25	1.25	1.25
Milwaukee, Wis.	.....	.86	.86	.96	.96	.96
Minneapolis, Minn.	.25– .35	.25– .35	1.25–1.35	1.25–1.35	1.25–1.35	1.25–1.35
Oxford, Mich.	.25– .35	.20– .30	.30– .40	.55– .75	.55– .75	.60– .75
St. Louis, Yeatman and Jedburg, Mo., also East St. Louis, Ill.	.60– .75	.45– .85	.50– .90	.20– .90	.20– .90	.20– .90
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.75	.75	.....	.....	.75
Urbana, Ohio	.65	.55	.65	.65	.65	.....
Waukesha, Wis.	.....	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.00	1.00	1.00
SOUTHERN:						
Brewster, Fla.	.40	.....	.....	.....	.....	.....
Charleston, W. Va.	.70	1.25	1.25	.....	.....	.....
Eustis, Fla.	.....	.60– .70	.....	.....	.....	.....
Fort Worth, Tex.	1.00	1.00	1.25	1.25	1.25	1.25
Knoxville, Tenn.	.75	.80	.....	.....	1.20	1.20
Roseland, La.	.50	.50	1.10	.85	.85	.....
WESTERN:						
Phoenix, Ariz.	1.25*	1.15*	1.50*	1.15*	1.00*	1.00*
Pueblo, Colo.	.80	.60	.....	1.20	.....	1.15
San Gabriel, San Fernando Valleys, Cal.(a)	.80	.70	1.20	1.20	1.20	1.20
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*

*Cu. yd. ‡Delivered on job by truck. (a) Discount, 20c per ton if paid by 10th of month following delivery. (b) In carload lots. (c) Gravel, 2½-in. down to ¼-in. (d) ⅝-in. down to ¼-in. (e) Plus 10c per ton for winter loading.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; per ton f.o.b. plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.00	.....	.....	.....	.....
Cheshire, Mass.	.....	.....	.....	.....	.....	5.00	.....
Columbus, Ohio	1.35–1.50	1.25–1.50	2.00	1.25–1.35	.....	3.50–4.50	.....
Eau Claire, Wis.	.....	.....	.....	.....	.....	2.00–3.00	.....
Elco, Ill.	Amorphous silica, 90-99½% thru 325 mesh, 10.00–60.00 per ton						
Mendota, Va.	Flint, 8.00–10.00 per ton						
Montoursville, Penn.	.....	.....	.....	1.35–1.60	.....	.....	.....
New Lexington, Ohio	2.50	1.75	.....	.....	.....	.....	.....
Ohlton, Ohio	1.75	1.75	.....	1.75	1.75	1.75	.....
Ottawa, Ill.	.....	.....	.....	.....	.....	3.50	.....
San Francisco, Calif.	3.50†	5.00†	3.50†	2.50–3.50†	5.00†	3.50–5.00†	.....
South Vineland, N. J.	Washed silica 1.50 per ton; washed and dried silica, 2.00 per ton						

†Fresh water washed, steam dried. *Damp. (a) Filter sand, 3.00.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Eau Claire, Wis.	4.30	.....
Ohlton, Ohio	1.75	1.75
San Francisco, Calif.	3.50	3.50

Glass Sand

(Silica sand is quoted washed, dried and screened)

Cheshire, Mass. (in carload lots)	5.00
Klondike, Mo.	2.00
Mendota, Va.	2.50–3.00
Ohlton, Ohio	2.50
Ottawa, Ill.	1.50
South Vineland, N. J.	1.75
San Francisco, Calif.	4.00–5.00

Bank Run Sand and Gravel

Buffalo, N. Y.—Sand, 1/10-in. down, 1.00; ¼-in. down, .85; gravel, all sizes	.75
Burnside, Conn. (sand, ¼-in. and less)	.75*
Crystal Lake, Ill.¶ (½-in. and less)	.30
Fort Worth, Tex.¶ (1½-in. and less, .65; 2-in. and less	.65
Gainesville, Tex.¶ (1½-in. and less)	.55
Grand Rapids, Mich.¶ (1-in. and less)	.50
Hersey, Mich.¶ (½-in. and less, .40; 1-in. and less)	.50
Mankato, Minn.†	.70
Winona, Minn.—Sand, any size	.50– .60
York, Penn.—Sand, ¶ 1/10-in. down, 1.10; ¼-in. and less	1.00

*Cu. yd. †Fine sand. 1/10-in. down. ¶Gravel.

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Portland Cement

	F.o.b. city named Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.79½	3.18	.....
Atlanta, Ga.	.....	†2.15	3.45¶
Baltimore, Md.	.....	†2.02	3.32¶
Birmingham, Ala.	.....	†1.81	3.11¶
Boston, Mass.	.46	†1.84	3.14¶
Buffalo, N. Y.	.45½	†1.82	3.12–3.22¶
Cedar Rapids, Ia.	.....	**2.23***	.....
Charleston, S. C.	.....	**1.89†**	**3.26¶**
Cheyenne, Wyo.	.58	2.32	.....
Chicago, Ill.	.....	1.79†	3.04¶
Cincinnati, Ohio	.....	1.80†	3.05¶
Cleveland, Ohio	.....	1.80†	3.05¶
Columbus, Ohio	.....	1.80†	3.05¶
Dallas, Tex.	.....	1.79	3.49¶
Davenport, Iowa	.....	**2.14***	.....
Dayton, Ohio	.....	1.80†	3.05¶
Denver, Colo.	.60	2.40	.....
Des Moines, Iowa	.48½	2.29*	.....
Detroit, Mich.	.....	1.85†	3.10¶
Duluth, Minn.	.....	2.04*	.....
Houston, Tex.	.....	1.89–2.00*	3.73¶
Indianapolis, Ind.	.54¾	1.79†	3.04¶
Jackson, Miss.	.....	†2.24	3.54¶
Jacksonville, Fla.	.....	2.12†	3.43¶
Jersey City, N. J.	.....	†1.99	3.29¶
Kansas City, Mo.	**.50½**	**2.02***	**3.32¶**
Los Angeles, Calif.	**.57½**	**2.30**	.....
Louisville, Ky.	.....	1.94†	3.19¶
Memphis, Tenn.	.....	†2.03	3.33¶
Milwaukee, Wis.	.....	1.94†	3.19¶
Minneapolis, Minn.	.....	**2.27***	.....
Montreal, Que.	.....	**1.60‖**	.....
New Orleans, La.	.....	1.91†	3.21¶
New York, N. Y.	.46	†1.84	3.19¶
Norfolk, Va.	.....	**1.97***	**3.27¶**
Oklahoma City, Okla.	.60¾	†2.43	3.73¶
Omaha, Neb.	.55½	†2.22	3.52¶
Peoria, Ill.	.....	**2.12***	.....
Pittsburgh, Penn.	.....	†1.81	3.11¶
Philadelphia Penn.	.....	†2.01	3.31¶
Portland, Ore.	.....	2.50‡	.....
Reno, Nev.	.....	**2.96‡**	.....
Richmond, Va.	.....	†2.18	3.48¶
San Francisco, Calif.	.....	**2.24‡**	.....
Savannah, Ga.	.....	1.89†	3.19¶
St. Louis, Mo.	.48¾	†1.60	2.85¶
St. Paul, Minn.	.....	**2.27***	.....
Seattle, Wash.	.....	1.55	2.50c
Tampa, Fla.	.....	2.00†	**3.41¶**
Toledo, Ohio	.....	1.80†	3.05¶
Topeka, Kan.	**.55¼**	**2.21***	**3.51¶**
Tulsa, Okla.	.57½	†2.30	3.60¶
Wheeling, W. Va.	.....	†1.80	3.10¶
Winston-Salem, N.C.	.....	2.44*	3.74¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Bonner Springs, Kan.	.....	**1.85**	**3.15¶**
Buffington, Ind	.....	1.44†	.....
Concrete, Wash.	.....	**2.65**	.....
Dallas, Tex.	.....	**1.74**	.....
Hannibal, Mo.	.....	1.66†	.....
Houston, Tex.	.....	1.84	.....
Hudson, N. Y. (d)	.....	2.21†	3.26¶
Independence, Kan.	.....	1.71†	.....
Leeds, Ala.	.....	1.46†	.....
Limedale, Ind.	.....	1.50	.....
Lime & Oswego, Ore.	.....	**2.50**	.....
Nazareth, Penn.	.....	**2.15**	.....
Northampton, Penn.	.....	1.51†	.....
Steelton, Minn.	.....	1.61†	.....
Toledo, Ohio	.....	**2.20**	.....
Universal, Penn.	.....	1.46†	.....
Waco, Tex.	.....	**1.75†**	.....

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. *Includes dealer and cash discounts. †Includes 10c cash discount. ‡Subject to 2% cash discount. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. ‖Includes sales tax. (c) Quick-hardening "Velo," packed in paper bags. (d) By truck.

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.25–1.30	1.25–1.30	1.25–1.30	1.25–1.30	1.25–1.30	1.25–1.30
Chazy, N. Y.	.75	1.60	1.60	1.30	1.30	1.30
Ft. Spring, W. Va.	.35	1.35	1.25	1.25	1.15	1.00
Frederick, Md.	.50–1.00	1.50	1.15–1.50	1.15–1.50	1.05–1.25	1.05–1.25
Oriskany Falls and Munnsville, N. Y.	.50–1.00	.....	.....	1.00–1.35	.....	.....
Prospect Junction, N. Y.	.80	1.10	1.10	1.10	1.10	1.10
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
Hillsville, Penn.	.85	1.35	1.35	1.35	1.35	1.35
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.75	.....	1.75	.....	.....	.....
Afton, Mich.	.25	.25	.25	.....	.65	1.50
Cypress, Ill.	1.20	1.10	1.10	1.00	.90	.90
Dubuque, Iowa	1.05	1.05	1.05	1.05	1.05	1.05
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05–1.70	1.05–1.70	.....
Greencastle, Ind.	1.25	1.00	.90	.90	.90	.90
Lannon, Wis.	.80	.80	.80	.80	.80	.80
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.75	.....	1.10	1.00	1.00	1.00f
Toledo, Ohio (a)	1.10	1.60	1.60	1.60	1.60	1.60
Toronto, Canada (j)	2.20	2.20	2.20	2.20	2.20	2.20
Waukesha, Wis.	.90	.90	1.00	1.00	1.00	.....
SOUTHERN:						
Cartersville, Ga.	.75	1.15	1.15	1.00	.90	.90
Chico, Tex.	.50	1.30	1.30	1.25	1.20	.....
El Paso, Tex. (k)	.50	1.25	1.25	1.00	1.00	1.00
Olive Hill, Ky.	.50–1.00	1.00	1.00	.90	.90	.90
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (h)	.25	.25	1.45	1.35e	1.25d	1.20
Cape Girardeau, Mo.	.90	1.25	1.10	1.10	1.00	.....
Rock Hill, St. Louis Co., Mo.	1.30–1.40	1.30–1.40	1.10–1.40	1.30–1.40	1.30–1.40	1.30–1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn.	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Bridgeport, Chico and Knippa, Texas	2.25–2.50	1.80–2.00	1.50–1.60	1.30–1.40	1.20–1.30	1.00–1.25
Duluth, Minn.	1.00	2.25	1.75	1.65	1.35	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Farmington, Conn.	1.00	1.30	1.30	1.00	.....	.....
Knippa, Texas	2.50	2.50	2.50	1.20	.....	.....
New Britain, Plainville, Rocky Hill, Middlefield, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.55	2.30	2.10	1.70	1.70	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Toronto, Canada (j)	4.80	5.90	4.05	.....	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Cayce, S. C.—Granite	.....	.....	1.60	1.60	1.40	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40l
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Lithonia, Ga.—Granite	.60	1.25	1.25	1.15	1.15	.....
Lohrville, Wis.—Granite	1.80	1.60	.....	1.50	1.50	.....
Middlebrook, Mo.—Granite	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
San Gabriel and San Fernando Valleys, Calif. (Granite)	.....	1.30	1.30	1.30	.....	1.30
(Basalt)	.....	.....	.....	.85	.....	.....
Toccoa, Ga.—Granite	.50	.....	1.25	1.30	1.20	1.20

(a) Screenings, including dust. (c) 1-in., 1.40. (d) 2-in., 1.30. (f) Rip rap. (g) Cu. yd. (h) Rip rap, 1.20–1.40 per ton. (j) Extra charge of 10c per ton for winter delivery; all prices less 5% for payment 15th following month. (k) Roofing gravel, per ton, 1.25. (l) Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem, Penn.	1.25–1.50	.50– .60	1.00	.60– .70	.70– .80	.70– .90	.90
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Hokendauqua, Penn.	1.50	.60	1.00	.80–1.00	1.00–1.25	1.00–1.25	1.00–1.25
Pittsburgh, Penn.	2.00	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.05*	1.80*	1.45*	1.45*	1.45*	1.45*
Jackson, Ohio	2.05*	.65*	1.55*	1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.10	1.00‡	1.10	1.10	1.10	1.10	1.10
SOUTHERN:							
Ashland, Ky.	2.05*	1.05*	1.65*	1.45*	1.45*	1.45*	1.45*
Ensley & Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Va.	2.50	1.25	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05*	.55*	.....	1.15*	.90*	.90*	.....

5c per ton discount on terms. †1½-in. to ¼-in., 1.05; ⅝-in. to 10 mesh, 1.25*; ⅝-in. to 0-in., 90c*; ¼-in. to 10 mesh, .80*. ‡Including dust.

Agricultural Limestone

(Pulverized)

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.	2.00
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, per ton	6.00
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; bulk, 3.00; in bags	4.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; in bags	5.00
Jamesville, N. Y.—Bulk, 3.90; in 80-lb. bags	5.15
Joliet, Ill.	3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, in 100-lb. paper bags, 3.75; bulk	2.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
West Rutland, Vt. — Analysis, 96.5% $CaCO_3$; 1% $MgCO_3$; 90% thru 50 mesh; bags, per ton, 3.75; bulk	2.50

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis, 99% $CaCO_3$; 0.3% $MgCO_3$, 90% thru 100 mesh	4.00
Bedford, Ind.—Analysis, 98.44% $CaCO_3$; 0.83% $MgCO_3$; 90% thru 10 mesh	1.50
Cartersville, Ga.—90% thru 50 mesh, per ton	1.25
Chico, Tex.—Limestone flour, or mill floats, per 100-lb. bag, f.o.b. plant	1.00
Colton, Calif.—Analysis, 95-97% $CaCO_3$; 1.31% $MgCO_3$, all thru 14 mesh down to powder	3.50
Cypress, Ill.—90% thru 100 mesh, 1.25; 50% thru 100 mesh, 1.25; 90% thru 50 mesh, 1.25; 50% thru 50 mesh, 1.25; 90% thru 4 mesh, 1.25; and 50% thru 4 mesh	1.25
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk, per ton	1.10
Dolomite, Calif.—Analysis, 54% $CaCO_3$; 45% $MgCO_3$; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton	1.70
Dubuque, Ia.—Analysis, 64.04% $CaCO_3$; 30.54% $MgCO_3$; 90% thru 50 mesh	1.05
Fort Spring, W. Va.—Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 90% thru 50 mesh; bulk, per ton	1.15
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; 50% thru 50 mesh	1.25
Lannon, Wis. — Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼-in. to dust)	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
Marlbrook, Va.—Precipitated lime-marl. Analysis, 96% $CaCO_3$; 1% $MgCO_3$, 90% thru 50 mesh, bulk, 2.25; in burlap bags	3.75
Olive Hill, Ky.—90% thru 4 mesh, two grades, per ton	.50 & 1.00
Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, and 45% thru 200 mesh, per ton	a4.00
Piqua, Ohio—30%, 50% and 99% thru 100 mesh	1.00–4.00
Stolle and Falling Springs, Ill.—Analysis 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh	1.15–1.70
Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
West Stockbridge, Mass.* — Analysis, 95% $CaCO_3$; 90% thru 50 mesh, bulk	3.50
100-lb. paper bags, 4.75; 100-lb., cloth	5.25
Waukesha, Wis.—90% thru 100 mesh, 4.00: 50% thru 100 mesh	2.10

*Less 25c cash 15 days. (a) Less 50c comm.

Pulverized Limestone for Coal Operators

Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton	6.00
Joliet, Ill.—Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh (bags extra)	3.50
Piqua, Ohio—99% thru 100 mesh, bulk, 3.25; in 80-lb. or 100-lb. bags	4.25
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk	2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.00

Lime Products

(Carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Bulk	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
EASTERN:								
Berkeley, R. I.	.....	.....	10.50	.....	.....	17.50	.....	19.25
Buffalo, N. Y.	.....	.....	.....	11.00	.....	.....	.....	.....
Cedar Hollow, Devault, Mill Lane, Knickerbocker, Rambo and Swedeland, Penn.	.....	9.50e	9.50e	9.50e	8.00i	9.50g	8.50	.....
Frederick, Md.	.....	8.50	8.50	8.50	.....	8.50	6.50	13.50
Lime Ridge, Penn.	.....	.....	8.00	.....	6.50	7.50a	4.50	.....
West Stockbridge, Mass.	.....	8.25– 8.75	8.25– 8.75	.....	.....	13.50j	10.00	15.35
CENTRAL:								
Afton, Mich.	.....	.....	.....	.....	.....	10.85	6.50	.....
Cold Springs, Ohio	.....	6.00	6.00	.....	.....	.....	6.00	.....
Clay Center, Gibsonburg, Marblehead, Tiffin, Ohio, and Huntington, Ind.	7.75	6.00	6.00	11.00	6.00	8.00	6.00	.....
Delaware, Ohio	7.75	6.00	6.00	7.00	6.00	.....	6.00	.....
Milltown, Ind.	.....	9.00	8.25	9.50	7.50	.....	7.00	.....
Sheboygan, Wis.	.....	10.50	10.50	.....	.....	.....	9.50	20.00h
White Rock, Ohio	7.75	.....	6.00	.....	6.00	8.00	6.00	.....
Woodville, Ohio	7.75	6.00	6.00	9.00	6.00	.....	6.00	15.00f
SOUTHERN:								
Keystone, Ala.	15.00	8.00	.....	7.50– 8.00	.....	.....	5.50k	13.75m
Ocala, Fla.	17.25	10.00	10.00	11.00	.....	.....	10.50	1.50
Knoxville, Tenn.	.....	8.00	8.00	7.50	.....	.....	6.00k	12.50
Pine Hill, Ky.	.....	8.00	8.00	7.50	.....	.....	6.00k	12.50
WESTERN:								
Little Rock, Ark.	.....	14.30	.....	14.30	.....	.....	.....	17.40
Kirtland, N. M.	.....	.....	.....	.....	.....	.....	15.00	.....
Los Angeles, Calif.	15.50	14.50	.....	.....	.....	.....	16.00	.....
San Francisco, Calif. (d)	20.00	20.00	12.00	20.00	.....	.....	.....	.....
San Francisco, Calif.	19.00	14.00–17.00	12.50	14.00–19.00	14.50c	.....	11.00b	.....

(a) In 100-lb. bags. (b) To 14.50. (c) Also 13.00. (d) Woodburnt lime: finishing hydrate, 20.00 per ton; pulv. lime, 2.00 per iron drum. Oil-burnt pulv. lime, 13.00–14.50 per ton. (e) In 50-lb. paper. (f) In steel; in wood, 14.00. (g) In 80-lb. paper bags. (h) In steel. (i) For chemical purposes. (j) To 17.50. (k) To 6.50. (m) To 14.85. *Price to dealers.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200-mesh, 6.00 per ton in paper bags

Slate Granules

Esmont, Va.—Blue, 7.50 per ton.
Granville, N. Y.—Red, green and black, 7.50 per ton.
Pen Argyl, Penn.—Blue-black, 6.00 per ton in bulk.

Roofing Slate

City or shipping point	Prices per square—Standard thickness 3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Bangor, Penn.—						
Gen. Bangor No. 1 clear	10.00–14.00	20.00	25.00	29.00	40.00	50.00
Gen. Bangor No. 1 ribbon	9.00–10.25	16.00	20.00	25.00	35.00	46.00
No. 1 Albion	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Gen. Bangor No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—						
Hardvein slate	8.00–11.00	13.50	20.00	25.00	30.00	35.00
Granville, N. Y.—						
Sea green, weatheripg	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green & gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple & unfading gr'n	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Pen Argyl, Penn.						
Graduated slate	.....	16.00	23.00	27.00	37.00	46.00

Albion blue-grey roofing slate, No. 1 clear, 7.25–10.50; mediums, 8.00–9.00; No. 1 ribbon, 8.00–8.50

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
- Crude talc, per ton 5.00
- Ground talc (20-50 mesh), bags 6.50
- Ground talc (150-200 mesh), bags 9.00
- Pencils and steel crayons, gross 1.50– 2.00

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh 7.00– 7.50
1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.

Clifton, Va.:
- Ground talc (150-200 mesh), in bags 10.00

Emeryville, N. Y.:
- Ground talc (200 mesh), bags 13.75
- Ground talc (325 mesh), in bags 14.75

Hailesboro, N. Y.:
- Ground talc (300-350 mesh), in 200-lb. bags 15.50–20.00

Henry, Va.:
- Crude (mine run), bulk 3.50– 4.00
- Ground talc (150-200 mesh), in bags 5.50– 8.25

Joliet, Ill.:
- Ground talc (200 mesh), in bags:
  - California talc 30.00
  - Southern talc 20.00
  - Illinois talc 10.00

Los Angeles, Calif.:
- Ground talc (150-200 mesh), in bags 15.00–25.00

Natural Bridge, N. Y.:
- Ground talc (325 mesh), bags 10.00–15.00

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.:
- B.P.L. 68%-70%, per ton 3.75– 4.00

Mt. Pleasant, Tenn.:
- B.P.L. 78%, furnace lump 6.25
- B.P.L. 72%, run of plant lump & fines 5.00

Ground Rock
(2000 lb.)

Gordonsburg, Tenn. 5.25– 6.00
Mt. Pleasant, Tenn.—(Lime phosphate) —B.P.L. 75%; per ton, bags extra 12.80
Mt. Pleasant, Tenn.—B.P.L. 72% 5.00– 5.50

Florida Phosphate

(Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines
- 68/66% B.P.L. 3.15
- 70% minimum B.P.L. 3.75
- 72% minimum B.P.L. 4.25
- 75/74% B.P.L. 5.25
- 77/76% B.P.L. 6.25

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Rumney Depot, Bristol and Cardigan, N. H.—Per ton:
- Punch mica, per ton 150.00–240.00
- Mine scrap 22.50
- Mine run 325.00
- Clean shop, scrap 25.00
- Roofing mica 37.50
- Trimmed mica, per ton, 20 mesh, 37.50; 40 mesh, 40.00; 60 mesh, 40.00; 100 mesh, 45.00; 200 mesh 60.00

Spruce Pine, N. C.—Mine scrap, per ton 18.00– 20.00

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

City or shipping point	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
East St. Louis, Ill.—Special Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton; floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 6 in. long, 17c per ft., 23.00 per ton.													
Grand Rapids, Mich.	.....	.....	.....	9.00	9.00	9.00	.....	.....	.....	.....	15.00	15.00	27.00
Los Angeles, Calif. (a)	.....	7.50	7.50	12.20	12.20	.....	13.20	.....	29.00	.....	.....	.....	.....
Medicine Lodge, Kan.	1.40	.....	.....	.....	.....	.....	11.50b	.....	16.00b	11.50b	.....	.....	.....
Oakfield, N. Y.	2.50	.....	.....	6.00	9.00b	9.00b	.....	6.00b	.....	.....	.....	.....	.....
Rumford, R. I.	.....	.....	.....	14.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	.....	14.90b	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	—	—	.....	.....	20.00	25.00e	33.00d

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) ⅜-in. plaster lath, 16c per sq. yd. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ⅜-in.x48-in. by 5 and 10 ft. long. (e) ⅜x48-in. by 3 to 4 ft. long.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N.Y.—Bio-Spar, per ton in bags, in carload lots, 9.00; less than carload lots, per ton in bags		12.00
Crown Point, N. Y.—Mica Spar		¶9.00–‖12.00
Davenport, Ia. — White limestone, in bags, ton	‖6.00	‖6.00
Los Angeles, Calif.—(e)		
White	¶12.00–‖14.50	¶12.00–‖14.50
Snowflake		¶12.00–‖14.50
Golden, browns, grey, blues, blacks	¶16.00–‖18.50	¶16.00 ‖18.50
Dolomite, Calif. (Lone Pine)—(e)		
White	¶9.80– ‖9.80	¶9.80– ‖9.80
Snowflake		¶9.80– ‖9.80
Golden, browns, grey, blues, blacks	¶13.80–‖13.80	¶13.80–‖13.80
Middlebrook, Mo.—Red		20.00– 25.00
Middlebury, Vt.—White		¶9.00–‖10.00
Middlebury & Brandon, Vt. — Caststone, per ton, including bags		c5.50
Phillipsburg, N. J.—Royal green granite, in bags	15.00– 18.00	
Randville, Mich.—Crystalite, crushed white marble, bulk	4.00	4.00– 7.00
Tuckahoe, N. Y.	6.00	
Warren, N. H. (d)		¶8.00– 8.50

¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb. (c) Per ton f.o.b. quarry in carloads; 7.00 per ton L.C.L. (d) L.C.L., 9.50-15.00 per ton in 100-lb. bags (e) Including bags.

Art and Cast Stone Aggregates

Los Angeles, Calif.—Dolomite aggregates, all sizes and colors†	¶10.00 ‖12.50
Dolomite special cast stone, wet cast aggregate, white, ¼-in. to dust a4.70	

† 100-lb. sacks. ¶C.L. ‖L.C.L. (a) In open cars.

Chicken Grits

Cypress, Ill.—(Agstone), per 100-lb. sack	.90
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per 100-lb. sack, f.o.b. Chico	1.00
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	6.00
El Paso, Tex.—(Limestone), per 100-lb. sack	.75
Gibsonburg, Ohio—(Agstone)	10.00
Joliet, Ill.—(Agstone)	10.00
Los Angeles, Calif.—(Gypsum), per ton, including sacks	7.50– 9.50
Marble grits, per ton, incl. sacks	10.00–12.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, Ohio—(Pearl grit), No. 1 and No. 2	1.00– 4.00
Port Clinton, Ohio—(Gypsum), per ton	6.00
Randville, Mich.—(Marble), per ton, bulk	6.00
Warren, N. H.	8.50– 9.50
Waukesha, Wis.—(Limestone), per ton	7.00
West Stockbridge, Mass.	¶7.50–‖9.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Cement Drain Tile

Grand Rapids, Mich.—Drain tile, per 1000 ft.

4-in.	40.00	15-in.	325.00
5-in.	50.00	18-in.	450.00
6-in.	75.00	20-in.	600.00
8-in.	110.00	22-in.	750.00
10-in.	165.00	24-in.	850.00
12-in.	190.00		

Granular Glasspar

(Chemically Controlled)

Spruce Pine, N. C.—Color, white; analysis, K_2O, 7.20%; Na_2O, 3.70%; SiO_2, 70%; Fe_2O_3, 0.05%; Al_2O_3, 17.50%; per ton, in bulk 10.50

Soda Feldspar

De Kalb Jct., N. Y.—Color, white; pulverized (bags extra, burlap 2.00 per ton, paper 1.20 per ton); 99% thru 140 mesh, 16.00; 99% thru 200 mesh 18.00

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 5.50%; Na_2O, 5.50%; SiO_2, 68.80%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk 18.00

Potash Feldspar

East Liverpool, Ohio — Color, white; analysis, K_2O, 11.00%; Na_2O, 2.25%; SiO_2, 68.00%; Fe_2O_3, .08%; Al_2O_3, 17.95%, pulverized, 99% thru 200 mesh, in bags, 22.00; in bulk 20.00

Erwin, Tenn.—White; analysis, K_2O, 10.50%; Na_2O, 2.75%; SiO_2, 67.75%; Fe_2O_3, .08%; Al_2O_3, 18.00%, pulverized, 98% thru 200 mesh, in bags, 16.00; bulk 15.00
Crude, in bags, 7.50; bulk 6.50

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.30%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk 18.00

Trenton, N. J.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 69%; Fe_2O_3, 0.08%; Al_2O_3, 17%; pulverized, 98% thru 200 mesh; bulk, 20.00; in bags 21.20

West Paris, Me.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.20%; Na_2O, 3.20%; SiO_2, 65.70%; Fe_2O_3, 0.09%; Al_2O_3, 19.20%; per ton, in bulk 19.00

Rochester, N. Y.—Color, white; analysis, K_2O, 12.50%; Na_2O, 2.60%; SiO_2, 64.20%; Fe_2O_3, 0.06%; Al_2O_3, 19.10% pulverized 98% thru 200 mesh; in bags, 23.50; bulk 22.00

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

Beloit, Wis.:	
4x8x16. Each	.11
6x8x16. Each	.13
8x8x16. Each	.15
10x8x16. Each	.19
12x8x16. Each	.21
Brookville, Penn.: 8x8x16	20.00–23.00*
Camden, N. J.: 8x8x16, each	.18b
Chicago, Ill.:	
8x8x16. Each	.17§
8x8x16. Each	.20a
Columbus, Ohio: 8x8x16	14.00§–16.00‡
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12‡
Lexington, Ky.:	
8x8x16	‡18.00*
8x8x16	†16.00*
Los Angeles, Calif.:	
4x8x12	4.50*
4x6x12	3.90*
4x4x12	2.90*
Omaha, Neb.: (c)	
8x 4x16, each .06½§; 8x6x16, each	.09§
8x 8x16, each, .10§; 8x12x16, each	.15§
Oak Park, Ill.:	
8x8x16, per 1000	160.00
Passaic, N. J.: 8x8x16 in. Each	.16
12x8x16 in. Each	.24
Pittsburgh, Penn. (Prices at yard)	
8x 8x16. Each	.17§
8x 8x16. Each	.19a
8x12x16. Each	.20§
8x12x16. Each	.22a
Wichita, Kan.: 8x8x16. Each	.11§

*Price per 100 at plant.
†Rock or panel face.
‡Face. §Plain. (a) Rock face. (b) Less 10%. (c) Faced block, priced 2c higher than plain block prices quoted.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French and Spanish tile, 9x15-in., per sq.	9.50–12.00
Closed end shingle, 8½x12½ in., per sq.	11.00–13.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Lexington, Ky.—8x15, per sq.: Red	15.00
Green	18.00
Longview, Wash.: 4x6x12-in., per 1000	55.00
4x8x12-in., per 1000	65.00
New Castle, Penn.—Red, 9x15-in.	12.00
Green, 9x15-in.	15.00
New York City, N. Y.:	
Roofing tile, red, 10.00; green	12.00

Cement Building Tile

Oak Park, Ill. (Haydite):	
8x 8x16, per 100	20.00
Lexington, Ky.:	
5x8x12, per 1000	55.00
4x5x12, per 1000	35.00
Longview, Wash. (Stone Tile):	
4x6x12, per 1000, at plant	54.00
4x8x12, per 1000, at plant	64.00
Prairie du Chien, Wis.:	
5x8x12, per 1000	78.00
5x4x12, per 1000	46.00
5x8x6, per 1000	41.00

Wichita, Kan.: (Duntile)	Plain	Glazed
8x8x12. Each	.10½	.14
6x8x12. Each	.09½	.13
4x5x12. Each	.05	.08
4x4x12. Each	.04½	.07½

Concrete Brick

Prices given per 1000 brick, f.o.b. plant.

	Common	Face
Beloit, Wis.	18.00	26.00– 35.00
Oak Park, Ill., "Haydite"	16.00	
Ensley, Ala., "Slagtex"	*10.00–13.00†	
Milwaukee, Wis.	14.00	20.00– 35.00
Omaha, Neb.	15.00	
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	16.00	30.00

*Price f.o.b. plant. †Delivered on job in city.

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00
Joliet, Ill.—All passing 100 mesh, f.o.b. Joliet, including cost of bags	24.00

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.	.....	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	.....	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans La.	35.00	45.00	60.00
Norfolk Va.	35.00	50.00	65.00
Passaic, N. J.	40.00	52.50	70.00
Patchogue, N. Y.	.....	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% discount.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4-in.	6-in.	8-in.	10-in.	12-in.	15-in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in.
Grand Rapids, Mich. (b)																	
Sewer	.....	.12	.18–.20	.27½	.35	.57½	1.00	1.11	1.48	1.66	.....	.....	.....	.....	.....	.....	.....
Culvert	.....	.....	.....	.57	.67	.93	1.20	.....	1.48	1.80	2.10	2.25	3.35	4.00	5.10	5.85	7.42
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Mercedes, Texas																	
Tongue and groove	.16	.20	.23	.29	.35	.....	.74	.91	.....	1.38	.....	2.28	.....	.....	.....	.....	.....
Sewer	.16	.22	.32	.41	.53	.78	1.05	.....	.....	1.98	.....	.....	.....	.....	.....	.....	.....
Milwaukee, Wis.	Cast stone window sills, 5 in. x 5½ in., 50c per lineal ft.																
Newark, N. J. (d)	.....	.....	.....	.....	.90	1.15	1.50	.....	.....	1.85	2.35	2.76	3.77	4.93	6.21	7.66	9.28
Unreinforced	.....	.16	.25	.37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Norfolk, Neb.	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Tiskilwa, Ill. (e)	.....	.....	.....	.75	.85	.95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Wahoo, Neb. (c)	.....	.....	.....	.....	.85½	.....	1.14	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31

‡21-in. diam. (a) 24-in. lengths. (b) Sewer, 21-in., 1.29; culvert, 21-in., 1.45. (c) Reinforced, 15.40 per ton, f.o.b. plant. (d) Reinforced, 21-in., 1.69; unreinforced, 21-in., 1.26; 5% cash discount. (e) Reinforced.

News of All the Industry

New Incorporations

Unyte Corp., Wilmington, Del., $500,000; 10,000 shares common. To produce cement, plaster, etc.

Suffern Stone Co., Suffern, N. Y., 1500 shares common. L. M. Woodworth, Pearl River, N. Y.

Braen Sand and Gravel Co., Hawthorne, N. J., $200,000. J. W. and E. A. DeYoe, Paterson, N. J.

Michigan Transit Mixed Concrete Co., Detroit, Mich., $600,000.

Builders' Sand and Gravel Co., Davenport, Ia., $20,000.

Newark Sand and Gravel Co., Newark, Ark., $20,000. H. L. Dickinson, Benton, Ark., and others.

Cotton Belt Sand and Gravel Co., Jonesboro, Ark., $20,000. H. L. Dickinson, Benton, Ark., and others.

Virginia Rock Products Co., Inc., Charlottesville, Va., $50,000. A. W. Higgins, president, Alexandria, Va. To quarry limestone.

Zanesville Gravel Co., Zanesville, Ohio, 1250 shares of no par value. Charles H. Everitt, L. M. Gardner, Thomas S. Johnson, and M. P. Coyle, 231 Atlas Bldg., Columbus, Ohio.

Blue Diamond Co., Malden, Mass., $25,000; 2500 shares at $10 each. Albert E. Tuttle, president and treasurer; Wm. H. Hastings and Sophia C. Heller.

Spy Run Sand and Gravel Corp., Fort Wayne, Ind., 500 shares of no par value. Levi H. McAfee, Wm. C. Hagerman, Theodore Hagerman and Otto Buechner.

General Aggregates Corp., Memphis, Tenn., 250,000 shares common. A. J. Hoffman, president, and W. W. Fischer, chairman of the board. Corporation to acquire the properties of six large companies producing sand, gravel, crushed rock and agricultural limestone in the Central South.

Quarries

Belmont County, W. Va. The county commissioners have purchased a crusher to be used for crushing limestone for use in road building.

Hutton O'Connor has petitioned for permission to open a rock quarry on the Enegren property up Coos River, Oregon.

DeWitt, Mo. It is expected that the government will soon resume work at the Huddleston quarry, which is located southwest of DeWitt.

Wauzeka, Wis. A quarry may be opened on Chunat Bros.' farm this spring, the rock to be used for surfacing Dutch Ridge road.

Eagle, W. Va. The county is preparing to open a stone quarry on Isaac's creek in this district in addition to the one it is now operating on Robinson's run.

Breckenridge, Mo. The rock crusher recently purchased by the city is now installed near the large rock ledge on the Bottom Forty adjoining the city on the northeast.

Sellersburg Stone Co., which has a quarry located about a mile and one-half southeast of Sellersburg, Ind., has been taken over by William Ehringer.

Weston and Brooker Co. is planning additions to its large granite crushing plant at Camak, Ga. At this time 100 tons are being shipped daily to various parts of Georgia for highway work.

Mt. Moriah, Mo. The state highway department has leased a quarry site on the Ray Arney farm, south of Mt. Moriah, the rock quarried to be used for building a road from Mt. Moriah to Cainsville, Mo., and for other road work.

Montgomery County, Kan. The Board of County Commissioners has closed the four rock quarries being operated by the county, since a sufficient amount of rock is on hand to take care of the bridge and road work that will be done this year.

Bellevue United Stone Co., Bellevue, Mich., elected the following directors at its recent meeting: John L. Hoyt, Frank Sedlecky, Stephen Pasztor, John Sharkey, Earl Kelly, Ernest Pasztor and Julius Kennedy.

Nicholls Stone Co., Kipton, Ohio, has contracted with the Ohio Electric Power Co. for the erection of a power line from Oberlin, Ohio, to Kipton, to provide additional current for its operation. The quarry began operations at Kipton four years ago and has expanded rapidly.

Michigan Limestone and Chemical Co., Rogers City, Mich., has called 420 men back to work, and when regular work in the plant and quarries starts, 500 more former employes will be put to work. The company has had only a skeleton force at work since the close of lake navigation.

L. W. Hayes of the Hayes Construction Co. of Bethany, Mo., operators of the Bethany crushed stone plant, visited Gallatin, Mo., recently to investigate prospects for the probable location of a quarry there to furnish crushed stone for farm-to-market roads in that section of the state.

Acme Limestone Co., Alderson, W. Va., at its recent annual meeting elected the following directors: James F. Prince, T. L. Woodson, J. A. Rigg, E. Chase Bare and Frank A. Prince. Frank A. Prince was named president; T. L. Woodson, vice-president, and J. A. Rigg, secretary-treasurer.

Jersey Limestone Quarries, Inc., Hamburg, N. J. Walter C. Diggs of Newton, N. J., has been appointed receiver for the company on the application of the Caleb Rude Estate, Inc., complainant. The complainant alleges that the quarry firm owes $4900 rent on the stone quarry tract leased from them.

H. D. Barndollar, Joplin, Mo., is negotiating for the lease of a strip of land on the A. A. Glick farm at Breckinridge, Mo., preparatory to installing a rock crusher. Test holes will be drilled to ascertain the quality of the rock deposit, and if found satisfactory a crusher will be installed at once.

National Lime and Stone Co. has shipped the large stone crusher which had been installed at the abandoned Bluffton, Ohio, plant to its plant at Marion, Ohio. The Bluffton plant was destroyed by fire 18 months ago. The company's Lewisburg, Ohio, office was ransacked by burglars recently. The combination and hinges were knocked off the safe, but the burglars failed to open it and nothing was taken.

Baldwin Park, Calif. The application of Charles W. Coughran for permission to establish a rock crushing plant on his land south of the Willits and Green grounds and adjoining the San Gabriel river is before the county supervisors again and it is expected that he will secure their approval. Mr. Coughran owns 50 acres of land west of Francisquito and Frazie streets, where he expects to build a concrete tile plant, and the rock crushing plant is for the purpose of supplying material for the tile works.

Sand and Gravel

Benton Harbor Sand Co., Benton Harbor, Mich., reported dissolved.

Saxet Sand and Gravel Co. has received a contract to deliver approximately 100,000 tons of sand and gravel from its plant at Victoria, Tex., for road construction in Neuces county, south Texas.

Northeast Missouri Sand and Gravel Co's plant near New London, Mo., has been reopened. Since its shutdown last fall extensive improvements have been made.

New London, Mo. The gravel plant here has begun spring operations, after a shutdown of several weeks for improvements, including the installation of new machinery.

J. J. Boland Co., Inc., Hudson, Mass., has sold its sand and gravel business to Mrs. E. M. Boland and the pit is now in operation under the new management.

Iowa Falls Sand and Gravel Co., Iowa Falls, Ia., is preparing the Moody gravel pit southeast of Iowa Falls for commercial use. A railroad spur is being built and connected up with the Northwestern railroad.

Cumberland Sand and Gravel Co., Nashville, Tenn., according to reports, has leased land on the river at Carthage, Tenn., and the company's large dredge boat and sand and gravel digging machinery is expected to be in operation here shortly.

Sturm and Dillard Co., Circleville, Ohio, has resumed operations after being shut down for more than a month for repairs and the installation of new equipment. At present no night shift is being employed by the company, but it will be added shortly.

Columbus Gravel Co., Columbus, Miss., elected the following officers at a meeting of directors: C. G. Kershaw, Birmingham, Ala., president; W. Broadnax, Dallas, Tex., vice-president; C. F. Harris, Columbus, general manager; H. A. Porterfield, Birmingham, Ala., treasurer, and A. B. Arnett, Columbus, secretary.

South Bend Sand and Gravel Corp., South Bend, Ind., has filed suit in the United States district court to prevent the South Shore railway from putting into effect a new schedule of tariffs on sand and gravel between South Bend and Michigan City, Ind., and intermediate points. The company objects to an increase of from 10 to 20 cents a ton on gravel and sand.

Cement

Trinity Portland Cement Co., Fort Worth, Tex., is rebuilding its clinker grinding plant, including an installation of Bradley Hercules mills.

Lone Star Cement Co. of New York, Inc., Hudson, N. Y., has resumed full operation of its plant, after a shutdown of 60 days, during which time the plant has been undergoing extensive repairs.

Dewey Portland Cement Co., Dewey, Okla., which has spent between $200,000 and $300,000 for repairs and equipment during the past three months, has reopened with its full force of about 300 employes.

Colorado Portland Cement Co.'s plant at Boettcher, Colo., was inspected recently by 200 members of the Denver Chapter, American Institute of Bankers, who traveled to Boettcher by special train.

Northwestern States Portland Cement Co.'s plant at Mason City, Ia., has been closed down for annual repairs. B. A. McDonald, assistant to the president, stated that according to present plans the plant will be reopened shortly.

Monarch Cement Co., Humboldt, Kan., has resumed operations on a limited scale. The company is operating only three kilns, available storage space not being sufficient to justify running at full capacity.

Lehigh Portland Cement Co. has resumed operations at its New Castle, Penn., plant, after the completion of repairs and improvements. The Oglesby, Ill., mill of the company is to be closed down indefinitely, pending an increase in the market for cement.

Manitowoc Portland Cement Co.'s plant at Manitowoc, Wis., will be closed down for a temporary period, possibly two weeks to a month. Silo capacity of the plant, both here and at its shipping points, is completely filled and production must await shipment.

Superior Portland Cement, Inc., Seattle, Wash., as announced by E. P. Lucas, president, has recently contracted for the largest cement order received by the company this season. This covers the delivery of between 40,000 and 50,000 bbl. of cement to the navy yard at Bremerton. The cement will be delivered in bulk via the Great Northern railway and Puget Sound Navigation Co.

Coplay Cement Manufacturing Co., Coplay, Penn., held an interesting and instructive safety meeting in its machine shop on February 25. Wm. F. Nagle, chairman of the company's safety committee, opened the meeting with an address on the outstanding proceedings of the state safety convention held at Harrisburg, Penn. Charles Lynch of the Department of Labor and Industry of Pennsylvania spoke on safety in general and a special state drive for no accidents during 1931, and H. E. Mick, assistant operating manager, delivered an address on applying general safety principles in all walks of life.

Lime

The National Gypsum Co. has resumed operations at its Luckey, Ohio, lime plant, after being closed for two months.

Cement Products

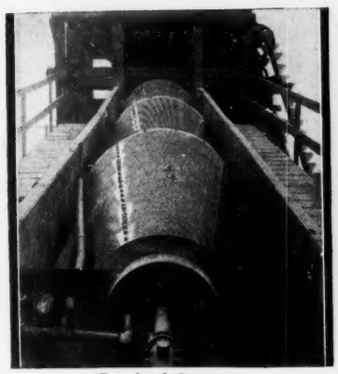
Superior Concrete Block Co. is to erect a plant on Roselawn avenue, Toronto, Can., for the manufacture of cement shingles and concrete blocks.

Boston Sand and Gravel Co., Cambridge, Mass., is contemplating the erection of another (third) concrete mixing plant.

Agricultural Limestone

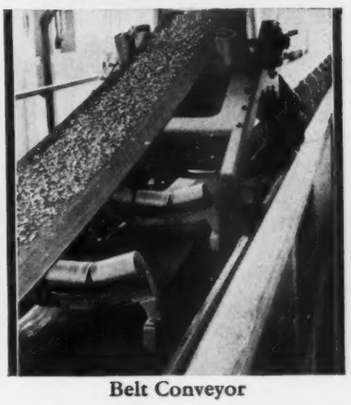
Turner and Co. has completed the installation of machinery and equipment for the production of agricultural limestone at its plant at Franklin, Va.

LINK-BELT Materials Handling and Positive Power Transmission Equipment

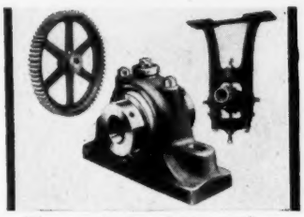


Conical Screens

Complete Sand and Gravel Washing Plant



Belt Conveyor



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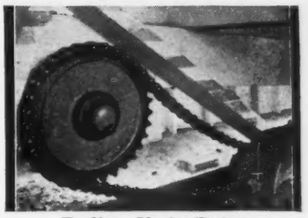
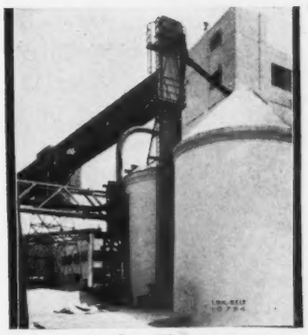
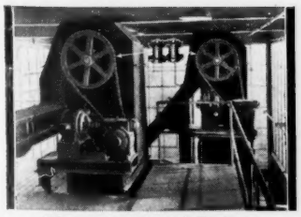


Roller Chain Drive

Crawler Loader

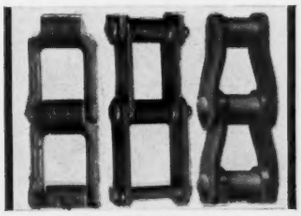


Bucket Elevator



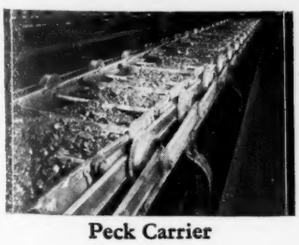
Elevator Head Drives

Vibrating Screen



Chains

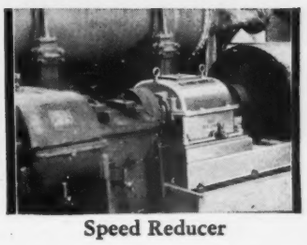
Portable Belt Conveyor



Peck Carrier

Water Intake Screen

Screw Conveyor



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